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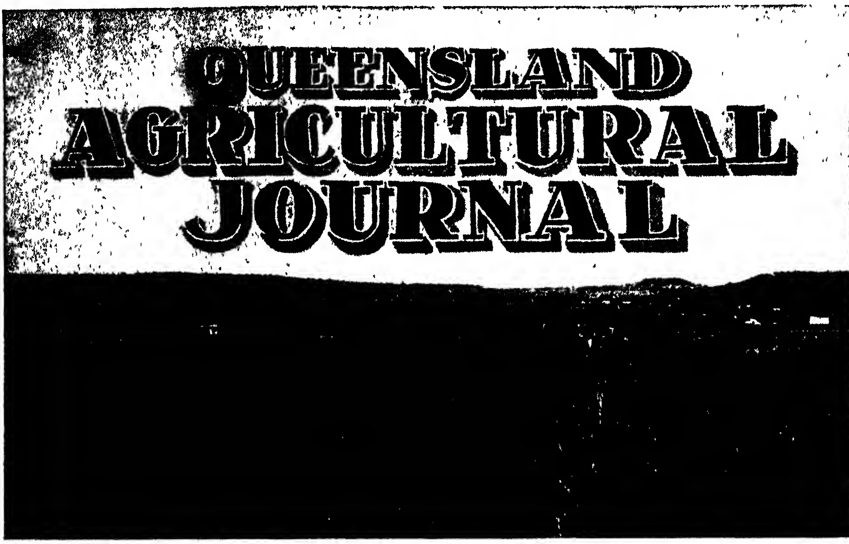

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Event and Comment.

The Royal Visit.

AN outstanding impression of the visit of His Royal Highness the Duke of Gloucester—one of the most notable events of the month of December—was his keen interest in country life, its industries, and its people. At Terrica he saw something of station life and work among sheep and cattle, and of the high standards attained in the several branches of animal husbandry as practised in Queensland, and of which Terrica provided typical examples. The temperate fruit lands of Stanthorpe and their evidence of skilful farming as applied in modern orchard practice had also an especial interest for the Duke. The blood stock studs near Warwick and the vast wheatfields of the Darling Downs attracted his close attention, while the lucerne lands of the Lockyer—a glorious picture after recent rains—and the wealth of the parallel dairy and diversified farming country also obviously impressed him. At the Queensland Agricultural High School and College at Gatton the Royal visitor met future leaders of rural industry in Queensland at a big parade of students, of whom 282 are in residence. The college and its curriculum embracing the science and practice of agriculture and animal husbandry plainly impressed His Royal Highness, and in subsequent conversation with His Excellency the Governor, Sir Leslie Wilson, he expressed his pleasure and great interest in what he had seen. At

Buderim, too, the Duke found much to interest him during the following week-end in the highly cultivated fruits of that rich region, which within a single generation of Queenslanders has emerged from the primitive to the practical—from pathless jungle and rain forest to productive citrus orchards, banana groves, coffee plantations, and pineapple gardens. To the Royal visitor, these rich fruit lands and their cocoa-coloured soil in cultivated orderliness vied in challenging charm with the brilliant sunlight, the tumbling surf on golden beaches, and the scenic beauty of misted mountain, wild woodland, and the open ocean as blue as the Mediterranean.

At the Showground in Brisbane there was presented to the Duke an array of primary products and stock exhibits that constituted a microcosm of the rural industry of the whole State, and with which the Duke was no less impressed. In his reply to the address of welcome, he said to a large assemblage of farmers and other citizens:—

> "I thank you for the words in which you have expressed sentiments of loyalty to the King, my father, on behalf of your members, who include men and women engaged in every form of agricultural and industrial activity in this great State. The King, as a farmer and stockbreeder himself, will greatly appreciate these assurances of loyalty, coming as they do from fellow farmers across the world, whose exhibition he has himself had the pleasure of opening.
>
> "I am glad to be the fourth member of my family to be the guest of your association, and I am most grateful for the cordial welcome and hospitality which you have extended to me to-day. I have been much interested by your record of the association's activities and products, and of the extent to which those products are disposed of within the Empire. This wonderful arch shows me not only their variety and range but their quality, and it enables me to realise more clearly that this is a State of great achievement and of even greater promise. I only wish that time permitted of my seeing all the districts whose products are exhibited here, and of personally offering to the producers my congratulations and good wishes. I ask you to do so on my behalf, and I assure you that I shall carry away from Australia very pleasant recollections of my visit here to-day."

A Great Work.

AT the Diploma Day function of the Queensland Agricultural High School and College, His Excellency the Governor, Sir Leslie Wilson, said that he regarded the college as the most important educational institution in the State. He emphasised that to Queensland agriculture was of vital importance. From the earliest days agriculture had been the foremost of the industries of the world. Those who went on the land to-day were gaining a fine and full life and a realisation that they were doing men's work—a work well worth doing; a great work for their State, country, and Empire. The strength of Britain came from her yeomen, and he hoped that those who went on the land to-day would, like the yeomen of England, be ever ready to do national service for their country should the necessity arise.

Country Consciousness—An Appeal by the Premier.

AN earnest appeal to all parents who had boys available for work on the land to interest themselves in the opportunities offered by land pursuits was made by the Premier, Hon. W. Forgan Smith, at the Diploma Day ceremony. Mr. Forgan Smith, whose own son is a student at the Agricultural College preparing for a country career, said it was their duty and privilege to enter manfully into the possession of their great agricultural inheritance. It was their duty to cultivate the land and develop the State, and to do that they must get the aid of all intelligent people. Queensland for all time must be an agricultural country, and her future depended on the use they made of their opportunity. In the last analysis the only title to hold land was to put it to the best use. History showed that if they did not adequately develop it they might be compelled to make way for other people who would make better use of the land. The difficulties that beset the world were not outside the scope of man's own control. They could not in Australia complain that they lacked the essentials for building a great civilisation. It was up to them to use their collective intelligence so that the resources of Nature should be made available to all industrious people. In that direction people must become more "land-minded" than at present. He viewed with very grave misgiving the fact that while a number of youths were unemployed in all the great cities and work was available for them on farms it was difficult to fill those positions. Life on the land could be made attractive.

Put Boys on the Land.

MR. FORGAN SMITH added that the most impressionable period in life was between the ages of fourteen and twenty-one. During that period the habit of application to honest industry must be obtained. If a boy or girl did not get that training in industry or in habits, then he feared that their future would be poor indeed. It was their duty to develop Queensland's inheritance in land that they might be deemed worthy descendants of the country's pioneers. To do that they must settle this land with our own people and with our own boys. The problem of boys in industry was associated with the question of employment generally. It had been suggested that conditions were such that employers were not permitted to engage as many boys as they might like. But in skilled industries very few employers had as many apprentices as the law allowed. That was a serious position from a State point of view. Boys should be given the opportunity of learning trades for their own sakes and the sake of the nation. When normal times arrived there must be boys properly equipped for those trades. It was necessary that the minds of boys and girls should be turned to land, and land occupations, and that the intelligent co-operation of all interested in obtaining employment for the large number of boys and girls leaving school every year should be received. Everything the Government could do towards encouraging more employment of youth would be done, and he hinted that more would be announced on that subject shortly.

The Minister's New Year Message.

To the

FARMERS OF QUEENSLAND

SLOWLY but surely the world is emerging from the clouds of depression and is thinking of the more prosperous days ahead, but clear thinking and good leadership are essential if these hopes are to materialise.

Good leadership for those engaged in primary production was never more essential than to-day, for the problems arising from economic nationalism have already exercised a disturbing influence in our overseas trade in primary products. What then is the solution? The answer is not difficult and may be expressed in one word—co-operation. This implies the fullest and closest understanding of the nature of problems, and the intelligent application of this knowledge. We may take heart, however, that so far we have been able to resist restriction of production with all its evils, and have presented a unanimous opinion against such proposals. I earnestly hope that this attitude will be maintained during the difficult months ahead. The formation of a Federal Economic Agricultural Council will become the mouthpiece for the hopes, desires, and aspirations of our farming community, and the future is therefore fortified by the fact that at last Australia will speak with one agricultural voice.

I thank you all for help given to the Department during the past and, on behalf of the Department, wish you all a Happy and Prosperous New Year.

Frank. W. Bulcock

Codling Moth Control by Non-arsenical Sprays.

By HUBERT JARVIS, Entomologist.

DURING the last few years the use of arsenic in any form for the control of insect pests affecting fruits or vegetables intended for human consumption has become increasingly unpopular. Accordingly, with a view to finding a satisfactory substitute for arsenate of lead for the control of codling moth, experiments were carried out in the Stanthorpe district in the 1932-33 season with certain non-arsenical sprays. Interesting results were obtained which indicated the possibility that the use of arsenate of lead was not necessary in controlling this pest and, in order to confirm or invalidate these results, the experiment was repeated with certain additions and modifications during the 1933-34 season. The information obtained in this additional experiment is detailed in this report, the results of the earlier experiment having been published in the July (1933) issue of this Journal.

The Experimental Plot.

The orchard chosen for the experiment was situated in the Summit section of the district, and was separated from surrounding orchards by fairly large areas of scrub land, thus being more or less isolated. The codling moth infestation in the orchard during the previous few years had been fairly heavy, and it was thus considered very suitable for the work in view. It was realised that a late-maturing variety would give the fairest possible test for codling moth control, and accordingly the variety Granny Smith was chosen, because the apples would remain on the trees throughout the season until about the end of March. The plot comprised seven rows of trees, there being four trees to each row. The trees were all small, and the crop light, some trees carrying only two cases of fruit.

Materials Used and Mode of Application.

The treatment of the trees in the plot was as follows:—

Row No. 1—Trees 1 and 2 controls untreated; trees 3 and 4 barium fluosilicate.

Row No. 2—Trees 1-4 nicotine sulphate-white oil, but trees 3 and 4 given a calyx spray of arsenate of lead instead of the other insecticide.

Row No. 3—Trees 1-4 katakilla-white oil, with calyx spray as above.

Row No. 4—Trees 1-4 white oil 1-64 with calyx spray as above.

Row No. 5—Trees 1-4 white oil 1-100, with calyx spray as above.

Row No. 6—Trees 1 and 2, arsenate of lead; trees 3 and 4, controls untreated.

Row No. 7—Trees 1 and 2, potash soap; trees 3 and 4, katakilla.

In the case of the trees in Rows 2, 3, 4, and 5, however, the final spray applied on 15th February was white oil at 1-80 strength.

Barium fluosilicate was used at a strength of 1 lb. to 40 gallons; nicotine sulphate-white oil at the strength nicotine sulphate 1-640 and white oil 1-80. Katakilla-white oil was used at a strength of katakilla 2 lb. to 32 gallons, with white oil 1-80. White oil alone was used at 1-64 and 1-100 strengths. The arsenate of lead strength was 1 lb. to 40 gallons, except in the case of the calyx spray, which was double that strength, and the potash soap was used at a strength of 2 lb. to 32 gallons, katakilla also being used at 2 lb. to 32 gallons.

Five treatments were given in each case, and the spray was applied with a knapsack spray outfit fitted with a special spraying nozzle, enabling a very fine mist-like spray to be obtained. Approximately half a gallon of spray was used for each tree at each application, and each tree received a very thorough covering. All sprays were applied during sunny weather, and rain occurred very soon after the first four treatments. The cost figures are based on the local prices of the materials used.

Weather Conditions.

The rainfall, as will be seen from Table I., was heavy, being the most abundant for many years, and conditions were exceptionally favourable for the growth of the trees, although the excessive flow of sap may have been a factor contributing to the abnormal shedding of fruit, which occurred in the experimental orchard and generally in the district in the very early stages of development.

TABLE I.

STANTHORPE RAINFALL, 1933-34.

October, 1933	318 points
November, 1933	541 points
December, 1933	514 points
January, 1934	406 points
February, 1934	260 points

Seasonal Incidence of Codling Moth in the Stanthorpe District.

The codling moth was more troublesome in most orchards than was the case during the previous season, and many growers lost fairly heavily owing to this pest. This increase of moth was in great measure due to the wet conditions experienced preventing the application of sprays with a power spray at critical times, owing to the boggy nature of the orchards.

TABLE II.

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity of Insecticide in Ounces.	Quantity of Spray Fluid in Gallons.	Cost per Application.	Total Cost.
					s. d.	s. d.
1933.						
25th October..	2	Barium fluosilicate 1 lb. to 40 gallons	½	1	Not available	
16th November	2		½	1		
20th December	2		½	1		
1934.						
18th January	2		½	1		
15th February	2		½	1		

TABLE II.—*continued.*

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity of Insecticide in Ounces.	Quantity of Spray Fluid in Gallons.	Cost per Application.	Total Cost.
					s. d.	s. d.
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	1 8½
25th October	2	Nicotine sulphate 1·640, White oil 1·80	Nicotine sulphate ⅛ oz., White oil 4 oz. Each application to the four trees	1	0 2½	
16th November	4			2	0 5	
20th December	4			2	0 5	
1934.						
18th January	4			2	0 5	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	1 10
25th October	2	Katakilla 2 lb. to 32 gallons, White oil 1·80	Katakilla 2 oz., White oil 4 oz. Each application to the four trees	1	0 2½	
16th November	4			2	0 5½	
20th December	4			2	0 5½	
1934.						
18th January	4			2	0 5½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	0 11¾
25th October	2	White oil 1·64	White oil 5 oz. Each application to the four trees	1	0 1¼	
16th November	4			2	0 2½	
20th December	4			2	0 2½	
1934.						
18th January	4			2	0 2½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead 2 lb. to 40 gallons	Arsenate of lead 1 oz.	1	0 1	0 8¼
25th October	2	White oil 1·100	White oil 3 oz. Each application to the four trees	1	0 0¾	
16th November	4			2	0 1½	
20th December	4			2	0 1½	
1934.						
18th January	4			2	0 1½	
15th February	4	White oil 1·80 ..	White oil 4 oz. ..	2	0 2	
1933.						
25th October	2	Arsenate of lead. Calyx spray 2 lb. to 40 gallons. Cover sprays 1 lb. to 40 gallons	1	1	0 1	0 3
16th November	2		0½	1	0 0½	
20th December	2		0½	1	0 0½	
1934.						
18th January	2		0½	1	0 0½	
15th February	2		0½	1	0 0½	
1933.						
25th October	2	Potash soap 2 lb. to 32 gallons	1	1	0 1	0 5
16th November	2		1	1	0 1	
20th December	2		1	1	0 1	
1934.						
18th January	2		1	1	0 1	
15th February	2		1	1	0 1	
1933.						
25th October	2	Katakilla 2 lb. to 32 gallons	1	1	0 2	0 10
16th November	2		1	1	0 2	
20th December	2		1	1	0 2	
1934.						
18th January	2		1	1	0 2	
15th February	2		1	1	0 2	

Results Obtained.

On the data secured during the seasons 1932-33 and 1933-34, it is evident that arsenate of lead is not necessarily the most effective insecticide for the control of codling moth, and indeed the nicotine sulphate-white oil combination during both seasons gave a higher percentage of control than arsenate of lead. The katakilla-white oil spray, although fairly satisfactory as regards codling control, caused very considerable loss through scorching of fruit and foliage. Katakilla alone was quite unsatisfactory. White oil at 1-64 and 1-100 strengths was disappointing in this experiment. Potash soap gave decidedly interesting results, and further work with this spray seems justified, as it was the second cheapest non-arsenical spray used, and gave 80 per cent. sound fruit.

The efficiency of the nicotine sulphate-white oil combination renders it a very promising substitute for arsenical sprays, in spite of the fact that it is more expensive. There is, moreover, a considerable amount of experimental evidence that the nicotine sulphate-white oil combination as used in this experiment has a definite value as a fruit-fly repellant, and thus its value is very greatly enhanced. Some consideration has, however, to be given to possible cumulative ill effects of repeated applications of oil sprays, this being a point on which it is hoped to obtain evidence in the near future.

The figures showing the value or otherwise of the substitution of an arsenate of lead calyx spray for the other insecticide were certainly interesting, for although in three instances a slightly higher percentage of sound fruit was obtained where an arsenate of lead calyx spray was substituted, the difference is not nearly so great as was expected. It is, of course, almost universally believed that the calyx treatment with a double strength arsenical spray is of paramount importance.

TABLE III.

CODLING MOTH INFESTATION AT TIME OF PICKING.

Treatment.	Total Number of Apples.	Sound.	Per Cent.	Unsound.	Per Cent.	Codling infested.	Windfalls.
Barium fluosilicate	400	222	55·5	178	44·5	178	39
Nicotine Sulphate-White Oil	532	500	93·9	32	6·1	32	25
Katakilla–White Oil	292	225	77·1	67	22·9	67	31
White Oil 1·64 ..	537	375	69·8	162	30·2	162	35
White Oil, 1·100 ..	359	250	69·7	109	30·3	109	43
Arsenate of Lead..	266	225	84·6	41	15·4	41	23
Potash Soap ..	250	201	80·4	49	19·6	49	19
Katakilla	434	225	51·8	209	48·2	209	54
Controls	1,077	275	25·6	802	74·4	802	106

Acknowledgments.

Thanks are due to Major Letters, of the Summit, who very kindly made available his orchard for the work, and who rendered much assistance during the progress of the experiment. Thanks are also due to the Chief Entomologist, Mr. Robert Veitch, for his valuable co-operation and advice.

Pineapple Wilt Disease and its Control.

By H. K. LEWCOCK, M.Sc., B.Sc.Agr., Assistant Plant Pathologist.

NO other problem of pineapple culture has proved more difficult of solution than the prevention of wilt. Pineapple wilt is not a specific disease; as generally used the term refers to a type of plant failure which may arise from a variety of causes. Since the actual cause of wilting in pineapples is not always readily apparent, a certain amount of confusion exists amongst growers concerning the various types of wilt, their identification and their relative importance one to another.

PINEAPPLE WILTS OCCURRING IN QUEENSLAND.

In Queensland, the term "wilt" is commonly applied to failure of pineapple plants resulting from the attacks of three separate and distinct root-destroying organisms, any two or all three of which may occur together in one plantation. These root parasites are: (1) Nematodes (*Heterodera marionii*), (2) White grubs (*Lepidiota spp.*), and (3) Pathogenic fungi (*Phytophthora cinnamonii* et al.). In Hawaii, the pineapple mealy bug (*Pseudococcus brevipes*) has been found to induce still another type of wilt which, fortunately, is not yet known to occur in Queensland.

On imperfectly drained soils, pineapple wilt may develop without the agency of any parasitic organism, due to asphyxiation or drowning of the roots. This form of wilt, which is most likely to occur in wet seasons, is usually confined to small patches located in hollows or at the foot of slopes. However, owing to the sub-normal vitality of pineapples grown on poorly drained or compact soils, they are especially susceptible to the parasitic types of wilt, even in seasons of average rainfall.

Of the types of pineapple wilt known to occur in Queensland at the present time, by far the most important is that resulting from attacks of root-destroying fungi. Although nematodes and white grubs may cause acute wilt in certain types of soil under favourable conditions, the area affected is usually limited in extent, and does not enlarge very rapidly.

Nematode wilt in pineapples usually occurs on land which has previously carried a nematode-susceptible crop, such as tomatoes, or in plantations where it is the practice to grow this and similar small crops between the rows of pineapples. Wilt resulting from white grub injury is infrequently met with, and has been observed to occur only on red volcanic soils. In any case, the aggregate losses from nematode and white grub wilts are small in comparison with those caused by fungus root rots. To distinguish the lastnamed type of wilt from the others mentioned it has been named the wilt disease. This wilt disease is, unfortunately, all too prevalent in Queensland at the present time, and during the past few years it has caused extensive losses in nearly every district.

DESCRIPTION OF WILT DISEASE.

Wilt disease develops chiefly throughout the spring and early summer months, and is most prevalent during years of excessive rainfall. Plants one to two years old are most subject to attack, which invariably results in cessation of growth, both of suckers and parent plant.

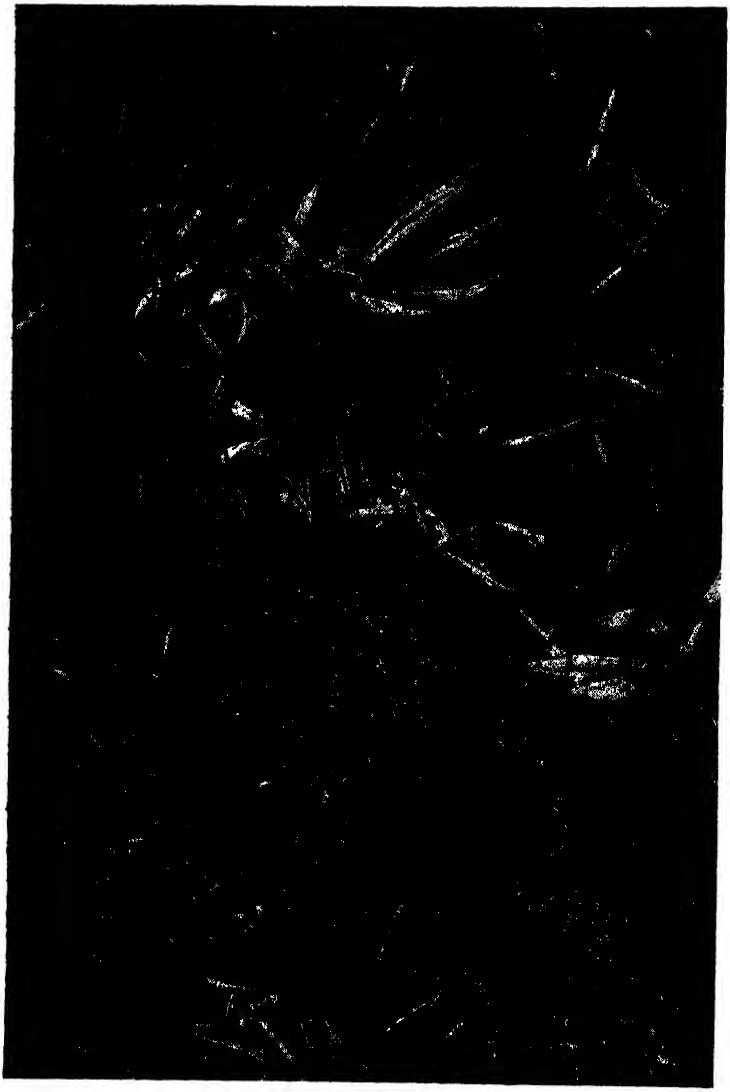

PLATE 1.

Pineapple wilt disease in a young plantation at Woombye. Note the contrast between the collapsed foliage of the diseased plants in the foreground and the erect growth of the healthy plants at the rear.

In the initial stages of the disease the leaves of affected plants lose their normal dark-green colour and assume a drab oblivaceous hue. At first limp and flabby, they quickly droop and fall to the ground. This collapse of the foliage is the most striking symptom of wilt disease (Plate 1). After the plant has collapsed the leaves wither, commencing at the tips, but the final stages of the disease are slow, and complete shrivelling of the foliage may be delayed for months or even years.

When a plant becomes affected with wilt disease while its fruit is still immature, the subsequent development of the fruit is arrested, and it colours prematurely. This premature colouring of immature fruit on

PLATE 2.

Two-year-old pineapple plant affected with wilt disease. Note the erect fruit stalk and the absence of sucker growths.

wilt-affected plants is preceded by a pronounced withering of the fruit stalk for several inches immediately below the base of the fruit. Despite the drying-out of the fruit stalk, however, its rigidity is usually such as to maintain the fruit in an upright position (Plate 2). Detachment of a fruit from a withered fruit stalk is a matter of comparative difficulty, a twisting movement being required to dislodge it. Prematurely coloured fruits from wilt-affected plants are spongy in texture and sub-acid to the

palate; consequently, they have no commercial value even when of marketable size, which is rarely the case.

Rotting of the roots is invariably associated with the foliage symptoms of wilt; in fact, decay of the roots may be well advanced before any foliage symptoms become apparent. Affected plants are usually so lacking in roots that they may be pulled from the ground with little effort.

The root-rotting fungi which cause wilt disease in pineapples are active chiefly during the winter and early spring months. The relatively low temperatures prevailing at this time of the year considerably reduce the rate of transpiration from leaves and fruit, and plants denuded of soil roots are able to maintain the rigidity of their foliage by absorption, through aerial roots, of the dew or rain water which collects in their leaf axils. The trough-like structure of turgid pineapple leaves makes them peculiarly adapted for collecting water in this way. However, with the advent of warmer seasonal conditions and the consequent acceleration of the transpiration rate, the water absorbed through the axillary or aerial roots is insufficient to meet the needs of the plant, and, in the absence of a subterranean root system, growth ceases, and a sudden collapse or ''wilting'' of the foliage takes place. This collapse of the leaves, which is the most striking symptom of wilt disease, is irreversible, as the aerial roots are unable to obtain sufficient nourishment for them to reach the soil and thus supply the water necessary to restore the foliage to a turgid condition. However, as some growers have observed, if wilt-affected plants are uprooted, their basal leaves stripped off, and the butt trimmed back to the embryo roots higher up the stem, they may be induced to make fresh growth on replanting. This practice is inadvisable, owing to the danger of further spreading the disease.

INCIDENCE AND DISTRIBUTION OF WILT DISEASE.

Outbreaks of wilt disease in pineapples are usually spasmodic in their occurrence, but when an outbreak does occur it may spread over a wide area with great rapidity. Until a few years ago only the soils of the older districts were infected with the fungous root parasites which cause wilt diseases, but the movement of planting material originating from wilt-affected plantations has greatly aided the dissemination of these organisms to the soils of the newer pineapple districts. At the present time the disease is known to occur in every pineapple producing district in Southern Queensland. New land, when first brought under cultivation, is usually free from pineapple wilt fungi, but it quickly becomes infected through soil carried on boots and implements, and through the planting of suckers, slips, or tops, contaminated with soil from diseased fields.

When a soil favourable to the development of pineapple wilt first becomes infected with root-rotting fungi, definite steps in the progress of the disease may be seen. On new land wilt first appears in roughly circular spots a few feet to several yards in diameter. Wilting is most advanced in the centres of these spots, while around their boundaries plants may be found showing only the very first symptoms of the disease. The plants just outside the wilt-affected spots appear healthy in every respect, although their roots are often already infected with fungi. The rate at which enlargement of the diseased areas takes place depends on a variety of conditions. The root-destroying fungi which

cause wilt disease in pineapples normally lead a saprophytic or scavenging existence in the soil, their capacity to act as parasites depending on the occurrence of certain conditions unfavourable to the pineapple plant itself. Any condition or circumstance which adversely affects the growth of the pineapple plant impairs its vitality, and thereby increases its susceptibility to attack from root-rotting organisms. Thus the vitality of the pineapple plant is a measure of its resistance to wilt disease.

SOIL CONDITIONS CONTRIBUTING TO THE OCCURRENCE OF WILT DISEASE.

The various factors which adversely affect the growth of pineapples and thus determine the development of wilt disease are not yet fully understood, but it is clear that the most important of these factors are soil and weather conditions. These factors are themselves inter-related. Because of its epiphytic or air-dwelling relationships and its limited root range, the pineapple plant is particularly sensitive to soil conditions, and the occurrence of wilt disease is almost always indicative of some deficiency in or unsuitability of the soil.

Soil Moisture.

One of the most important factors involved in producing soil conditions favourable for the development of wilt disease in pineapples in Queensland is the incidence and amount of rainfall. The heaviest losses from the disease occur during excessively wet seasons, as the subsoil formation of much of the coastal pineapple land has a relatively low permeability to water, due to accumulation therein of the leachings from the upper layers. Following periods of heavy rainfall the soil of such land may remain in a sodden, semi-waterlogged state a few inches below the surface for weeks or even months, thus providing conditions favourable for the development of wilt disease, as the pineapple plant is notoriously intolerant of any interference with free root transpiration.

Erosion or Wash.

Heavy downpours are not only harmful because of the excessively wet soil conditions which they induce, but also because of the incalculable damage which they cause through erosion or wash, especially in hilly country. Loose cultivated soil is much more readily dislodged by flood waters than that which is untilled or compacted and, consequently, erosion is often particularly acute in young fields during the wet months immediately following planting. Surface erosion also results in the loss of large quantities of organic matter, as the bulk of this soil constituent is contained in the surface layers.

In addition to soil impoverishment resulting from loss of plant foods, erosion also has a direct and immediate weakening effect on pineapple plants, due to the reduced root activity consequent on the removal of soil from around the root hairs concentrated close to the surface.

Organic Matter.

Pineapples cannot be grown successfully in soils lacking in organic matter. Furthermore, it has been found that the occurrence of wilt disease in pineapples is closely correlated with the amount of decaying vegetable matter in the soil. Deficiency or lack of this constituent results

in a weakened, short-lived, and wilt-susceptible type of growth, even when the mineral plant foods are supplied in abundance. Soils containing less than 3 per cent. of organic matter are generally unsuitable for pineapple culture.

The effect of organic matter on a soil is threefold—viz.: (1) physical, (2) biological, and (3) nutritional. In the early stages of its decomposition, however, the effect is predominantly a physical or mechanical one, and it is this effect which is of especial significance in pineapple soils. The stalks and fibrous materials hold the soil particles apart, thus preventing the formation of clods and hardpan, the water-holding capacity of the soil is improved, and drainage and soil aeration are facilitated. A high organic matter content provides moisture conditions favourable for pineapple root growth in the top soil layers where there is maximum aeration and drainage, and where excessively damp conditions conducive to wilt disease rarely obtain, even during abnormally wet seasons. Unfortunately, the soils of most of the pineapple districts in this State are deficient in organic matter, even when first brought under cultivation, and unless some provision is made for its replenishment this shortage becomes acute in a very short space of time. Failure to obtain profitable returns from old land when replanted with pineapples, or failure to prevent the spread of wilt disease in replanted areas, is frequently directly related to a deficiency of organic matter in the surface soil.

Soil Reaction.

Another important contributing factor to wilt development in pineapples is unsuitable soil reaction. Contrary to the views generally held by growers, pineapples thrive best in an acid soil, for the following reasons:—Firstly, because such conditions stimulate root growth; secondly, because acid soil conditions are usually associated with good drainage; and thirdly, because an acid soil solution has the capacity to supply both phosphorous and iron in concentrations adequate for the needs of this crop. Expressed in chemical terminology, the optimum soil reaction for pineapple growth, productiveness, and longevity has been found to lie between pH 4·5 and pH 5·0. The significance of soil reaction in determining the incidence of pineapple wilt disease is indicated by the fact that the disease has not yet been found to occur in Queensland on any soil of greater acidity than pH 5·1. Unfortunately, the acidity of most of the soils used for pineapple culture in this State is considerably lower than is desirable.

Liming of pineapple soils, by neutralising the slightly acid conditions which generally obtain in them, has also contributed to losses from pineapple wilt disease in Queensland. Once a fairly general practice, liming was carried out in the erroneous belief that acid soil conditions were harmful to pineapples. However, there is no record of any permanent benefit having accrued from the use of lime on pineapple soils in this State. This is possibly because the applications have generally been excessively heavy; light dressings of lime may occasionally be necessary on soils deficient in exchangeable bases, but such applications should be made with caution, and then only under technical direction.

PREVENTION OF WILT DISEASE.

The complete recovery of wilt-affected pineapple plants never occurs; in dealing with this disease prevention should be aimed at rather

than cure. The measures advocated for preventing wilt disease are largely directed at correcting the soil conditions which make its development possible. Incidentally, these preventive measures lead to more robust growth and increased yields.

Control of Soil Reaction.

Soils sufficiently acid to meet the requirements of pineapples occur only in a few localities in Southern Queensland, and then only over limited areas of country. Consequently, in most pineapple districts some increase in soil acidity is desirable.

Under field conditions the maintenance of the soil reaction at a definite point in the pH scale is not practicable, nor is it necessary. All that is required is for the soil reaction to be kept at or below the apparent "critical point" for wilt development—namely, pH 5·0—which also approximates to the optimum reaction for pineapple growth. This may be effected by the continued use of farmyard manures or other organic refuse, by repeated dressings of acidifying fertilizers such as sulphate of ammonia, or, more quickly, by a single application of *powdered* sulphur.

The rate at which sulphur should be applied to a pineapple soil in order to bring about a desired increase in acidity varies with the initial reaction of the soil, its texture, and its chemical composition. Other factors involved are the lack of uniformity in soil conditions throughout a field, and seasonal fluctuations in soil reaction. It has been found, however, that the action of the organism which oxidises sulphur to sulphuric acid in Queensland soils is arrested by a soil reaction of approximately pH 4·5, so that there is little or no danger of pineapple soils becoming too acid through the use of sulphur, even when it is applied in excessive quantities.

Throughout the coastal districts, where correction of soil reaction is most needed, an application at the rate of 600 to 700 lb. per acre should prove adequate in most cases. Once it is applied to soil, the oxidation of sulphur to sulphuric acid takes place with great rapidity, and ceases only when the supply of free sulphur is exhausted or when the concentration of acid reaches approximately pH 4·5. Any free sulphur which remains in the soil after this limiting acid concentration has been attained is not lost or destroyed, but is utilised gradually in maintaining the soil reaction at maximum acidity.

Sulphur should not be drilled into the ground or turned under by ploughing; it should be broadcast evenly over the surface just before planting, and then thoroughly scarified into the soil to a depth of 4 or 5 inches. On sloping land the rate at which sulphur is applied at the higher levels should be somewhat heavier than at the bottom of the slope. Sulphuring should be carried out during calm weather, preferably in the early morning. As previously pointed out, liming of pineapple soils—which has an opposite effect to sulphuring—is rarely advisable.

It should be clearly understood that, as far as the wilt disease is concerned, correction of the reaction of pineapple soils by the use of sulphur is purely a preventive treatment, and is likely to prove of benefit only when carried out prior to planting. Recent field experiments have shown, however, that the control of soil acidity is ineffective on land which has a low level of fertility, particularly with regard to its organic matter content.

Maintenance of Organic Matter.

This soil constituent should be conserved in every possible direction, since oxidation and consequent loss of organic matter proceeds with extreme rapidity in cultivated soils during the summer months, especially in the light sandy soils typical of the coastal districts. For this reason, summer cultivation of pineapple fields should be restricted to the shallow chipping necessary to destroy weed growth. On strong volcanic soils it is better to keep summer weed growth in check by cutting it down periodically rather than by cultivation, particularly on hillside plantations which are subject to wash. However, conservation of soil organic matter in itself is not enough. A soil well supplied with organic matter at the commencement of the cropping cycle may be seriously depleted in this ingredient after a few seasons, unless early provision is made for its replenishment. Horse, cow, or sheep manure is of inestimable value for this purpose, but its general use is precluded by the difficulty of obtaining supplies. In the Brisbane area pineapple plantations receiving annual dressings of stable refuse have thrived for more than fifty years without replanting being rendered necessary by wilt disease or soil impoverishment. Mulches consisting of dry grass, cane trash, or other plant refuse—provided it is free from weed seeds—are also of great value in pineapple plantations, not only because they enrich the soil in organic matter but also because they smother weed growth, conserve soil moisture, and stimulate surface root development.

Another and more widely applicable method of maintaining and replenishing the organic matter content of a soil is green manuring. Prior to replanting old land with pineapples it should be green manured both in winter and summer for at least two consecutive years. For winter planting, a quick-growing cereal such as barley is suitable, either when sown alone or, for preference, when mixed with a twining legume such as Golden vetch. Any nematode-resistant legume is likely to prove useful for green manuring old pineapple land during the summer months; the recently-introduced *Crotalaria goreensis* is promising particularly well for this purpose. It is deep-rooting, non-trailing, nitrogen-fixing, drought and nematode-resisting, and makes a strong, dense, branching growth both before and after cutting. This plant also promises to be valuable for cover-cropping young pineapple fields during the first summer after planting. Though not generally recognised, this is frequently the critical period in the life of a pineapple plantation, since oxidation of organic matter takes place with great rapidity in the loose, exposed soil, which is also very subject to wash during monsoonal downpours. A suitable deep-rooting leguminous cover crop planted between the rows of young pineapples at this stage of their growth not only retards oxidation of organic matter by shading the soil, but it also protects the latter from erosion, improves its drainage, and enriches it in nitrogen.

Drainage Improvement.

Measures for improving the drainage of land which is obviously subject to water-logging will seldom prove economically practicable, and such soils should be avoided for pineapples.

The drainage of soils, which are unduly retentive of moisture in wet seasons, may usually be greatly improved by the judicious placement of open-cut drains throughout the plantation, particularly along the headlands. The repeated use of a deeply-rooting cover crop, such as the

recently-introduced *Crotalaria goreensis,* will also do much towards improving the drainage of the leached coastal soils.

The permeability of soils which are retentive of water may be increased by the use of sulphur or gypsum. In addition to lowering the water-table of a soil, gypsum fixes free ammonia and, like lime, it also exerts a beneficial effect on the physical condition of a soil. Unlike lime, however, gypsum has little or no effect on soil reaction.

Prevention of Erosion.

For preventing surface or sheet erosion on steeply sloping land, contour drains should be employed in addition to the measures advocated for maintaining the organic matter content of a soil—namely, a minimum of cultivation during the summer months, and the widest possible use of mulches and cover crops, particularly those possessing fibrous or semi-woody stems.

Additional Cultural Precautions.

The source of the planting material used has much to do with the occurrence of wilt disease on new land. Whether it is intended to plant suckers or slips, care should be taken to see that these are obtained only from wilt-free stock. It is courting disaster to use planting material of unknown origin. The planting of butts is usually an unsound practice also, as these are mostly obtained from worn-out plantations in which wilt has often been prevalent.

In pineapple fields propagated from suckers, planting too deeply is occasionally a factor contributing to wilt disease outbreaks, due to the fact that root development from deeply planted sets is retarded by inadequate soil aeration and a weak, wilt-susceptible type of growth results. In several respects slips are to be preferred to suckers as planting material, one of which is that their structure precludes the possibility of excessively deep planting, thus permitting root growth to take place close to the surface.

In young plantations losses from wilt disease may sometimes be prevented by periodical rogueing or pulling out of all weakly or stunted plants, without waiting for definite wilt symptoms to develop. However, rogueing is only likely to prove effective when practised consistently from a few months after planting.

GENERAL RECOMMENDATIONS.

From the foregoing discussion it will be evident that losses from wilt disease in pineapples can be largely prevented by suitable cultivation practices and, where necessary, corrective soil treatments.

Briefly, it is recommended that land intended for pineapples should be—(1) Naturally well drained, (2) protected from erosion, (3) plentifully supplied with organic matter, and (4) suitably acid in reaction. If all these conditions are not fulfilled in the site selected for the plantation, the deficiencies should be rectified before planting is proceeded with or the land rejected in favour of a more suitable area. In addition, extreme care should be exercised in the selection of planting material. Subsequent to planting, care should also be taken to insure that the young plants receive no check in growth, and that all weakly or diseased plants are removed immediately they are observed.

Parasites of the Dog and Cat.

By F. H. S. ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

OF these two animals the dog is especially important in so far as its animal parasites are concerned, for some of these may, in some way or other, affect man and his live stock to a serious and sometimes fatal degree. Some of the numerous tapeworms that in the adult stage infest the dog may occur in their larval form in man, or the sheep, pig, &c. Of these the hydatid tapeworm is by far the most important, for its larval stage may cause in man a very serious and frequently fatal disease. Measles in sheep and gid in sheep are the result of infestation with the bladderworms or larvæ of two other dog tapeworms. A very common dog tapeworm, the double-pored tapeworm, which is spread by the dog flea and dog louse, has occasionally been found in the intestine of man. A skin disease of man, called creeping eruption, and prevalent in parts of America, has been shown to be due to the larvæ of a species of dog hookworm, which, in the human host, wander about under the surface of the skin. Sarcoptic mange, which is a common skin disease of dogs, may also be transmitted to man, and although the tiny mites responsible for the condition do not succeed in establishing themselves on their human host, they may live long enough to cause serious irritation and annoyance. Finally, the annoyance caused by armies of fleas, both indoors and outdoors, may usually be directly traced to the presence of the dog.

Control of the parasites of the dog becomes therefore a matter of the greatest importance. The dog is probably the most domesticated animal associated with man; it shares his house, sometimes his plate, and even his bed, and from the point of view of public health may, if its parasites are not controlled, become a serious menace. It is, therefore, the duty of every dog owner to see that his animals are regularly treated for both external and internal parasites, and what is more important, to take all possible steps to prevent them from becoming infested.

EXTERNAL PARASITES.

A variety of external parasites infest the dog and cat, the most important of which are lice, mites, ticks, and fleas.

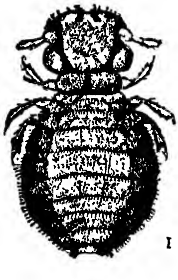

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PLATE 3.—THE BITING LOUSE OF THE DOG (*Trichodectes canis*). Enlarged (after Denny).
From Bulletin No. 5, New Series, U.S. Dept. Agric.

LICE.

Two species of lice are found on the dog, a biting louse, *Trichodectes canis* (Plate 3), and a sucking louse, *Linognathus setosus* (Plate 4).

The sucking louse is a small yellowish species which, by means of its piercing and sucking mouthparts, pierces the skin of the dog and sucks up blood and serum on which it lives. This louse has a long, slender, pointed head.

The biting louse is smaller than the sucking louse, with a comparatively broad and flat head. This louse lives on the scales, scurf, &c., to be found on the skin surface.

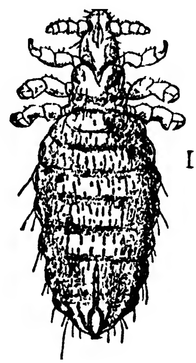


PLATE 4.—THE SUCKING LOUSE OF THE DOG (*Linognathus setosus*). From Bulletin No. 5, New Series, U.S. Dept. Agric.

Louse infestation may produce serious irritation, causing the animal to bite and scratch the infested portions of the body sometimes resulting in the formation of raw, tender areas. Puppies are especially susceptible to infestation, and cases are known in which the lice have been numerous enough to cause the death of these young animals. The biting louse is also an intermediate host of the double-pored dog tapeworm, which has on occasions been found in the small intestine of children.

Cats may be infested with a small species of biting louse, *Felicola subrostrata,* which, however, does not appear to be of much importance.

Treatment and Control.

Dogs infested with lice may be cleaned by a thorough washing in a phenolic dip.

Good results also follow the use of either derris or pyrethrum powder, which is dusted thoroughly into the coat of the animal. The powder should be allowed to remain on the dog or cat for about half an hour. It may then be combed or brushed out on to a newspaper, the paper with the dead and stupified lice thus obtained then being burnt.

In the case of cats, of course, only dusting is practicable.

The treatment should be repeated every eight to ten days till no more lice are seen.

MITES.

Mite infestation causes mange, a diseased condition of the skin which causes great irritation and makes the animal very weak and very susceptible to other parasites and other diseases. Great care should be exercised in treating a dog affected with mange for worms, as the animal may not tolerate the same dosage of the drug used as a healthy animal.

Dogs may suffer from three distinct types of mange, namely sarcoptic mange, demodectic mange, and auricular mange. Cats may also be affected by auricular mange and by a type of sarcoptic mange.

Sarcoptic Mange of the Dog.

This form of mange is caused by a minute mite, *Sarcoptes scabiei canis*, which is only one-fiftieth of an inch in size. This mite lives in galleries under the skin, the burrowing of the mites through the skin irritating the tissues and causing the formation of small red spots. In time papules appear from which serum exudes. The drying serum forms yellowish crusts which mat the hairs together. Ultimately the hair may fall out and bare scabby patches of skin are seen. The great irritation caused by the infestation results in the animal biting and scratching itself, thus forming large raw areas which may become invaded by bacteria. With the disease a distinctly mousy odour is associated. Sarcoptic mange usually commences on the head, elbows, and chest wall and on the hind legs in the region of the hocks and stifle. In advanced cases, the whole of the body may become affected, the health of the animal is greatly impaired, and unless treated the animal may die.

Occasionally, and especially in young animals, this disease takes the form of dry, bran-like scales matting the hair together. This type does not appear to cause any great irritation.

Treatment and Control.

The affected animal should be first clipped and washed thoroughly with green soap to remove all dirt, crusts, and scales. When this has been done wash the dog in a 1 per cent. solution of potassium sulphurata. Then apply—

1.	Liquor picis carbonis	10 parts
	Sublimed sulphur	10 parts
	Potassium carbonate	2 parts
	Cottonseed oil	120 parts
	or ..	
2.	A solution of lime sulphur.	

For localised mange 4 per cent. salicylic acid will give good results. "Odylen," to be applied as directed by the proprietors, is also a satisfactory treatment for mange.

When the infestation is extensive it is safest when using formula 1 to treat only one-quarter or one-third of the body at the one time. A complete cure might require several applications. In addition the animal should be muzzled to prevent him licking the treated portion of the body, and during the period of treatment the bowels should be kept open with Glauber's salts.

It should also be borne in mind that everything that will build up the health of the dog and increase its resistance to the disease should be considered. Good nourishing food, including an adequate supply of meat, fresh air, and exercise are necessary. A good tonic may be given, and as such the following will be found satisfactory:—

Citrate of iron and ammonia	5 grains
Liquor arsenici hydrochloricus ..	3 minims
Tincture nux vomica	5 minims
Chloroform water to make	2 drachms

This represents a single dose which is given twice daily after meals.

Kennels, &c., used by dogs affected with mange should be thoroughly cleaned and disinfected. It should be remembered that sarcoptic mange of the dog is transmissible to man, so great care should be exercised when handling dogs affected with this disease.

Scarpotic Mange of Cats.

This type of cat mange is caused by a minute mite known as *Notoedres cati* and is restricted usually to the head and neck. The disease causes the hair to fall out and the skin becomes wrinkled and scurfy with scab and pustule formation. The infestation causes great irritation to the cat, the animal shaking its head and continually scratching and rubbing the affected areas.

Treatment and Control.

Clip the hair from the diseased parts of the body and rub in vaseline. The vaseline is then removed by the use of a dry cloth and bran after about an hour. Then apply—

Sublimed sulphur	2 parts
Potassium carbonate	1 part
Lard	8 parts

The treatment is repeated every four to six days till the animal is cured. Attention should also be given to the sleeping quarters, &c., of the animal, which must be kept thoroughly disinfected.

Demodectic Mange of the Dog.

Also known as follicular mange, this skin disease is caused by a minute worm-like mite, *Demodex canis,* one-hundredth of an inch in size, which infests the hair follicles. The disease usually appears first around the head, elbows, and hocks, and takes the form of hairless patches often reddish in colour. These patches may simply extend and appear as scurfy areas, but if invaded by bacteria pustules of various sizes are seen. These may run together and the skin thickens and is easily damaged. The poisonous substances resulting from the infestation with the mites and bacteria become absorbed into the body and cause serious disorders. The animal becomes emaciated and weak and may die.

Treatment and Control.

There is no highly efficacious treatment known for demodectic mange, but if the treatment for sarcoptic mange is carefully followed and persisted with, the disease may be held in check and may sometimes be completely cured.

Castor oil smeared over the affected portions of the body has been recommended in some quarters. Another treatment which has been used successfully consists of the use of Lassars paste (salicylic acid 2 parts, starch 24 parts, zinc oxide 24 parts, and vaseline 50 parts).

It is now generally considered that the mite itself does very little harm and that the disease is due mainly to the invasion of the skin by pus-forming bacteria. The use of an autogenous vaccine—that is, a vaccine made from cultures of the bacteria present in the dog to be treated—has been advised and good results claimed from its use. Violet rays and X-rays have also been used successfully.

The treatment of mange is really a matter that can be dealt with competently only by a qualified veterinary practitioner, and owners of dogs affected with mange should have no hesitation in placing their animals under such care.

Auricular Mange in Dogs and Cats.

This type of mange is seen principally on the dog and its occurrence on cats is regarded as being rare. The mite causing this disease is called *Otodectes cynotis* and is slightly larger than the sarcoptic mange mite. Auricular or ear mange is confined to the ears, the irritation produced by the mites interferes with the production and disposal of wax and as a result the ear becomes filled with wax and other waste matter produced by the irritated tissues. The infested animal shakes the head and rubs and scratches the ears, causing sores and bleeding. Nervous symptoms may be shown, the animal whining and howling and is sometimes seized with fits.

Treatment and Control.

First remove all wax, &c., from the ear as carefully as possible with a pair of forceps, then swab the ear canal out with one of the following:—

1. One part of chloroform in nine parts of castor oil.
2. One part carbontetrachloride in three parts of castor oil.

Diagnosis of Mange in Dogs and Cats.

Dogs and cats may suffer from many skin diseases somewhat like mange in appearance, but in which parasitic mites are not concerned. As these particular diseases are treated by methods entirely different from those adopted for mange, it is essential that the cause of the condition be diagnosed before treatment is commenced. Mange can usually be determined only by the examination of skin scrapings, in which the mites can be seen under the microscope. These skin scrapings should be made from several parts of the affected area and the scrapings should be deep enough to cause the appearance of blood. They should then be placed in a tightly-corked bottle or sealed tin and forwarded to the laboratory.

THE DOG TICK (Rhipicephalus sanguineus).

A B

PLATE 5.—THE DOG TICK (*Rhipicephalus sanguineus* Latr.) (A) and (B).
A.—Male. B.—Female.

This is the common tick infesting the dog in Queensland and is found everywhere in the State, even in the dryest and hottest areas. The male is oval in shape and brown in colour and is to be seen crawling about among the hairs of the coat. (Plate 5 (A).) The unfed female is

greyish with dark-brown legs. (Plate 5 (B).) When engorged with blood the body colour changes to dark-red. The dog tick is an entirely distinct species from the common cattle tick, *Boophilus microplus,* which has pale fleshy legs.

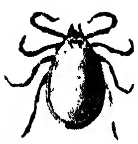
Life History.

The female tick when fully fed drops from the dog, crawls away to some sheltered spot, and lays her eggs, of which up to 2,500 may be deposited. The eggs hatch in from nineteen to forty-one days, giving rise to tiny six-legged larvæ. The larvæ soon commence to look for a host, attaching themselves at the first opportunity and begin to feed. After from three to seven days the larva is engorged, drops off the dog, hides away, and after a period of rest, sheds its skin to become a four-legged nymph. In turn the nymph attaches itself to the dog, engorges in from four to ten days, drops off, moults, and the adult tick appears. Again, the adult tick waits for a host, attaches itself, and if a female becomes fertilized by the male, engorging in from six to fifty days. She then drops off, lays her eggs, shrivels up and dies.

Treatment and Control.

The fact that the dog tick is a three-host tick and that the larva and nymph can survive as long as eighty days and 150 days respectively in the absence of the dog make its control by no means an easy problem. Premises on which dogs have been for some time become so heavily infested that no sooner is the animal cleaned by hand-picking or dipping than he is shortly afterwards just as thickly infested. Control of this tick is therefore largely a matter of patient effort. Following a thorough dipping in a phenolic dip the animal should be carefully examined at least every three to four days, and all ticks removed by hand. Particular attention should be given inside the ears and between the toes. In addition, his kennel and bedding should be kept as clean as possible, the kennel being frequently sprayed with dip and the bedding boiled. Any other places frequented by the dog should be marked and sprayed.

THE SCRUB TICK (Ixodes holcyclus).



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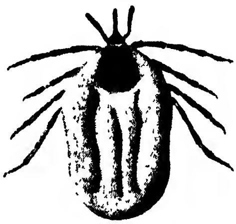

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PLATE 6.—THE SCRUB TICK (*Ixodes holocyclus Neum*) (A) and (B).
A.—Male. B.—Female.

This tick is normally parasitic on marsupials and is found throughout the scrubs of the eastern portion of the State. The male tick is oval in shape and yellowish in colour. (Plate 6 (A).) The unfed female has a greyish body with yellow legs. (Plate 6 (B).) When fully engorged with blood this sex assumes a very conspicuous size, and becomes dark-reddish in colour.

Among its marsupial hosts the scrub tick causes little harm, but when it attacks man and the domesticated animals a serious condition of paralysis may result. Dogs are especially susceptible to tick paralysis, and in areas where the tick is numerous it is an exceedingly difficult matter, unless adequate steps are taken, to keep a dog alive for any length of time.

An affected animal shows first of all paralysis of the hind limbs, the condition gradually including the forelimbs, head, and neck. When the paralysis reaches this stage the animal rarely recovers.

Treatment and Control.

Various remedies have from time to time been recommended for the treatment of tick paralysis; of these trypan blue is most prominent. This drug is made up and used as follows:—

A 2 per cent. solution (about nine grains to a fluid ounce of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly-folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The solution is used. The hypodermic syringe and needle before being used should be placed in a dish containing water, then placed over the fire and boiled for ten minutes. This is now ready for use when the solution has cooled.

The injection can be made anywhere under the skin, but the best positions are either in front of the chest or behind the shoulder. A fold of skin is caught up with the fingers of the left hand and the needle manipulated with the right hand.

The dose for dogs varies according to age and size from 1 to 5 drachms.

On the other hand, Dr. I. Clunies Ross, who has made a very careful study of tick paralysis, considers that there is no drug which is of any value once paralysis has appeared, and in such case his recommendations are as follows:—

1. Remove all ticks from the sick animal. Kerosene or turpentine are useful for this purpose, a few drops being placed on the tick. It is probably best to use a pair of sharp scissors and snip out with the tick the small piece of skin to which it is attached.
2. Any fluids should be given slowly and in small quantities only. If the animal vomits, water and nourishment should be given per rectum.
3. The rectum and bladder should be frequently emptied by the use of enemas and catheters.

Very few animals make a complete recovery and for this reason preventive measures are very important. In ticky country, therefore, the dog should be carefully examined daily for ticks, paying particular attention to the head, neck, and forequarters.

FLEAS.

The flea usually found on the dog is a different species from that occurring on the cat. The dog flea is known as *Ctenocephalides canis*

(Plate 7) and the cat flea as *Ctenocephalides felis*. These two species are by no means restricted to their respective hosts; the cat flea may be found on the dog, and vice versa, and both are concerned with infestations of dwellings, stables, and other outhouses, causing considerable annoyance to man and his livestock.

Life History.

The eggs laid by the female flea on the dog or cat fall to the ground and in time hatch to give rise to a tiny maggot. The maggot feeds on the animal and vegetable matter in the dust, &c., in which it lives. When fully grown the maggot forms a sort of cocoon from the debris around it and inside this cocoon it pupates. From this pupa the adult flea eventually emerges.

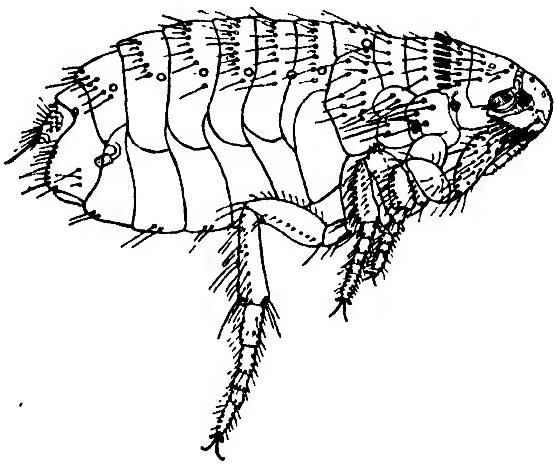


PLATE 7.—THE DOG FLEA (*Ctenocephalides canis*). Female. Lateral View. Enlarged. From Martini, 1923.

Control of Fleas on Dogs and Cats.

Dipping or the use of pyrethrum powder as directed for the control of lice will give good results. At the same time attention should be paid to the kennel and other places frequented by the animals, and these should be kept as clean and as free of litter a possible.

Control of Fleas Indoors.

Very frequently dwellings become infested with fleas and to eradicate these the following recommendations are given:—

1. If electricity is available a vacuum cleaner will get rid of a large number.
2. Remove all furniture and spray well with petrol. Petrol is highly inflammable and great care should be given its use. The skirting boards and cracks in the floor should receive special attention.
3. Hang all rugs, carpets, &c., in the sun and beat well.
4. Treat all cats and dogs as directed.
5. If the infestation is exceedingly heavy it may be best to place the matter in the hands of a reliable firm of fumigators.

Control of Fleas Outdoors.

Stables, pigsties, and the ground beneath dwellings are frequently infested by armies of fleas, and to control these the following suggestions are given:—

1. Treat all dogs and cats as directed.
2. Clean up all litter and surface dust and burn.
3. Sprinkle the soil with coarse salt and keep damp for a period of about 14-21 days. In cases where there is any danger of stock consuming large quantities of the scattered salt it is best to omit this chemical and use water only. This will destroy the larvæ, &c., in the breeding grounds.
4. Spray floors of outbuildings and other spots where adult fleas are present with petrol.

INTERNAL PARASITES.

Many different kinds of internal parasites have been recorded from the dog and cat, all of which, with the exception of one form which is related to the mites, are helminths or worms. Puppies and kittens are most seriously affected by internal parasites and a high death rate among these young animals may follow infestation.

ROUNDWORMS.

THE LARGE ROUNDWORMS OF THE DOG.

Two distinct species of large roundworms are found in the small intestine of the dog—namely, *Toxocara canis* and *Toxascaris limbata*. The latter species is an elongate whitish worm growing up to about

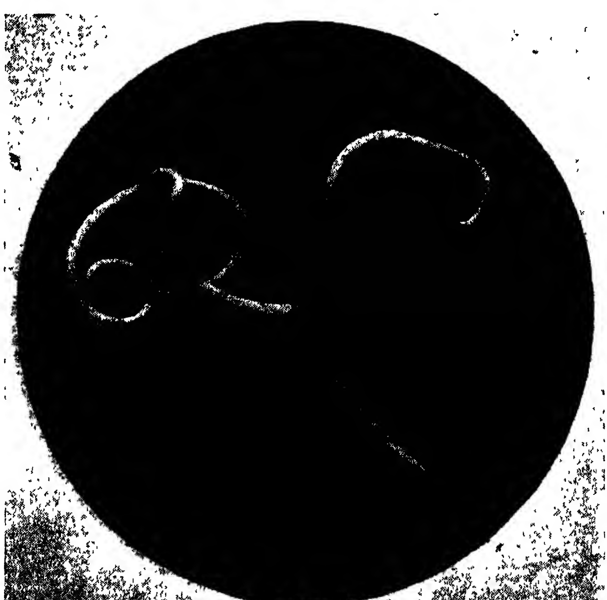


PLATE 8.—THE LARGE ROUNDWORM OF THE DOG (*Toxocara canis*). Natural size.

4 inches in length. The female is the larger of the two sexes, the male attaining only a length of about 2½ inches. *Toxocara canis* (Plate 8) is yellowish and somewhat larger and stouter, female worms measuring as much as 7 inches in length.

Life History.

The life history of both these species of roundworms is practically the same. The eggs laid by the female worms in the intestine are voided with the fæces and under favourable conditions of temperature and moisture reach the infective stage in a few days, when the egg contains a very tiny worm. When these eggs reach the mouth of the dog and are swallowed, they hatch in the small intestine and the young worms are set free. These burrow into the wall of the intestine, and, reaching the blood vessels, are carried in the blood stream to the liver. The tiny worms then travel on to the lungs, where they remain for several days. When their development in the lungs is completed, the worms, still very minute in size, crawl into the windpipe, reach the mouth, and are swallowed. In this way they reach the small intestine again, where they settle down and grow to maturity.

Effect on the Dog.

Infestation by these large roundworms is most serious among puppies and young animals, and when the worms are numerous an emaciated and unthrifty condition may be present. The worms may cause blockages in the intestine, seriously interfering with digestion, and it is not uncommon for them to wander into the stomach and cause vomiting. The larvæ, when migrating through the liver and lungs, may be responsible for serious injury to these organs with consequent ill-health to the infested animal. In general the following symptoms may be indicative of roundworm infestation:—A dull, harsh, and erect coat, emaciation, stunted growth, nervous disorders, diarrhœa, and sometimes bloated abdomen. The worms are frequently passed in numbers in the fæces or they may be vomited.

Treatment and Control.

Oil of chenopodium is the most satisfactory drug for the removal of the large roundworms. Withhold food overnight and next morning give the drug in capsules at the rate of 1 cubic centimetre for a 22 lb. dog, immediately preceded by 1 fluid oz. of castor oil. Do not allow any food till the bowels have moved.

Oil of chenopodium is a highly poisonous drug and great care should be taken to see that the castor oil moves the bowels. If no purgation has occurred within four to five hours after treatment another dose of castor oil should be given.

For puppies the dose rate is diminished to 1 to 3 minims with 1 fluid oz. of castor oil. Oil of chenopodium should not be used for dogs suffering from severe mange, distemper, gastro-enteritis, or in other cases of great weakness.

Tetrachlorethylene (Nema capsules) is much safer than oil of chenopodium though not so efficient and is given at the rate of 2 cubic centimetres for a 22 lb. dog. If the infestation is heavy it is just as well to follow the drug with Epsom or Glauber's salts.

Santonin is the safest drug for puppies and delicate breeds, and if given in the morning three hours before feeding at the rate of ¼ to 1

grain with an equal amount of calomel for six or seven days good results will be secured.

In addition to treatment preventive measures should be adopted. These consist of—

1. The prompt removal of all fæces from kennels and yards.
2. Treat all wooden floors with a boiling disinfectant solution.
3. Remove the old contaminated dirt surfaces and replace with new, clean soil.
4. Keep older animals free of worms by regular treatment.
5. Keep young animals away from contaminated yards, &c., as much as possible.

THE CAT ROUNDWORM (Toxocara mystax).

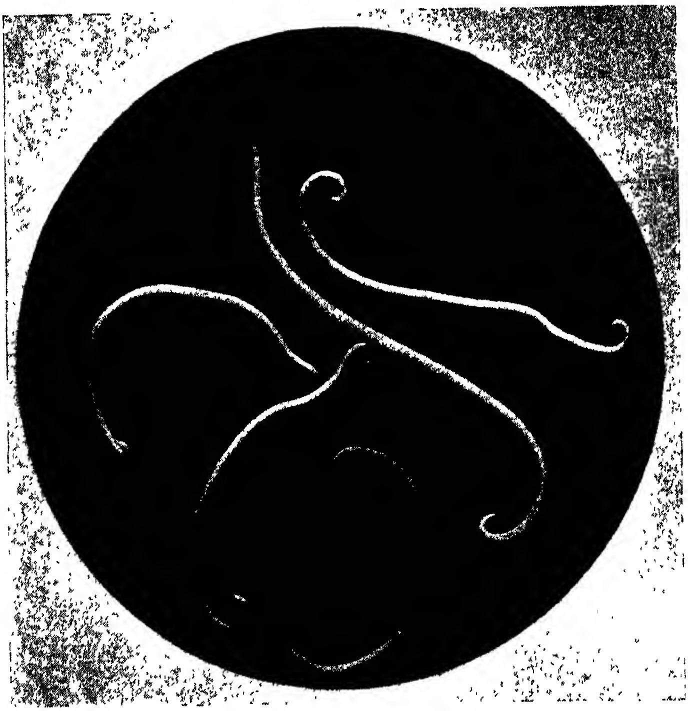


PLATE 9.—THE LARGE ROUNDWORM OF THE CAT (*Toxocara mystax*). Natural size

This is the large roundworm of the cat and is found in the small intestine. The female worm may attain a length of about 4 inches; the male is smaller, measuring only 2½ inches. Its life history and harmful effects are very similar to those detailed for the large roundworms of the dog.

Treatment.

Withhold all food overnight and next morning give tetrachlorethylene in capsules at the rate of 1 cubic centimetre for an 11 lb. cat, followed by 1 fluid oz. of castor oil five hours later.

HOOKWORMS (Ancylostoma caninum).

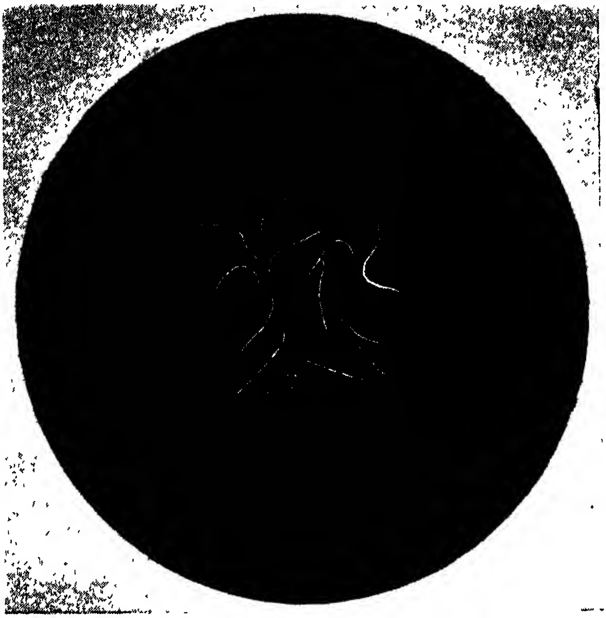


PLATE 10.—THE HOOKWORM OF THE DOG AND CAT (*Ancylostoma caninum*). Natural size.

In Queensland both dogs and cats may be infested with this species of hookworm. It is a comparatively small worm, ⅓ to ½ inch in length. The mouth is provided with six strong curved teeth which enable the parasite to grasp and feed on the wall of the intestine.

Life History.

The female worms in the small intestine lay numerous eggs which are voided in the fæces. In about 36 hours, under favourable conditions of temperature and moisture, these eggs hatch and tiny larval worms appear. The larva grows and develops in the fæces and eventually reaches a stage when it is completely enclosed in a sheath. It is now ready to infect the dog or cat and this may occur in either of two ways. The larva may be swallowed with food or water or it may bore its way into the body through the skin. In either case, the young worm reaches the blood stream and is carried to the lungs. From here it proceeds to the small intestine in much the same way as the larvæ of the large roundworms. Once in the small intestine it attaches itself to the wall of the intestine and grows to maturity.

Effect on Dogs and Cats.

The principal host of this hookworm is the dog, and so far as can be ascertained it usually occurs in the cat only in small numbers.

The worm is a notorious bloodsucker and a heavy infestation may cause a serious loss of blood. As a result the infested animal becomes anæmic, a condition which may be detected by examining the mucous membrane lining the mouth and eyes. In a healthy animal this is

pinkish to red, but if anæmia is present the membrane is bleached white. In addition the animal may show pot-belly and swellings under the jaw. Diarrhœa sometimes with blood-tinged fæces may be present. There is a distinct loss of condition, the coat is harsh and erect, the eye sunken, and the animal is dull and depressed.

Treatment and Control.

The tetrachlorethylene treatment as recommended for the large roundworms of cats and dogs respectively is also effective for hookworm in these animals.

Carbontetrachloride is a more efficient drug than tetrachlorethylene for the removal of hookworms from dogs though not so safe. The drug is given in capsule at the rate of 3 cubic centimetres for a 22 lb. dog. The treatment should include a purgative administered after the drug, Epsom salts or Glauber's salts being recommended.

All fats and oils should be excluded from the animal's diet for some days prior to treatment. The dog is starved overnight and the drug given next morning. If the bowels have not moved three hours after treatment, another dose of salts should be administered. No food should be given until proper purgation has been obtained. Tetrachlorethylene only should be used for puppies or animals in a weak condition.

Hookworm infestation can be prevented to a large extent if the preventive measures advised for the large roundworms are adopted.

THE WHIPWORM OF THE DOG (Trichuris vulpis).

This worm gets its common name from its resemblance to a whip. The species may grow up to 3 inches in length and is found in the cæcum or blind gut.

Dogs become infested when they swallow eggs which contain a tiny larval worm. These eggs hatch in the small intestine and the young worms become mature in the cæcum.

There is no simple and effective treatment yet known for whipworm infestation, but the use of santonin, as recommended for the large roundworms, is worth a trial.

The prompt removal of all dung, &c., is essential if whipworms are to be controlled.

THE HEARTWORM OF DOGS (Dirofilaria immitis).

This is a worm of conspicuous size which is found in the heart and pulmonary artery. The female may grow to about 12 inches in length, though the male rarely measures more than 5 or 6 inches. The species is very prevalent among dogs in North Queensland and is responsible for many deaths.

Life History.

The female worms in the heart or pulmonary artery deposit tiny active larvæ which escape into the blood stream. These larvæ are taken up by night-biting mosquitoes when they bite the dog and suck up blood. The larvæ undergo certain development in the mosquito, and when the insect bites a dog the larvæ are liberated into the blood stream of the animal and make their way to the heart or pulmonary artery, where they settle down and grow to the adult stage. There is a possibility that the dog flea and cat flea may also act as an intermediate host in much the same way as the mosquito.

Effect on the Dog.

Frequently no symptoms are shown till the dog is being exercised, when the animal may drop down as if dead to recover after a while. On other occasions such symptoms as abdominal dropsy, emaciation, difficult breathing, coughing, and convulsions are associated with heart-worm infestation.

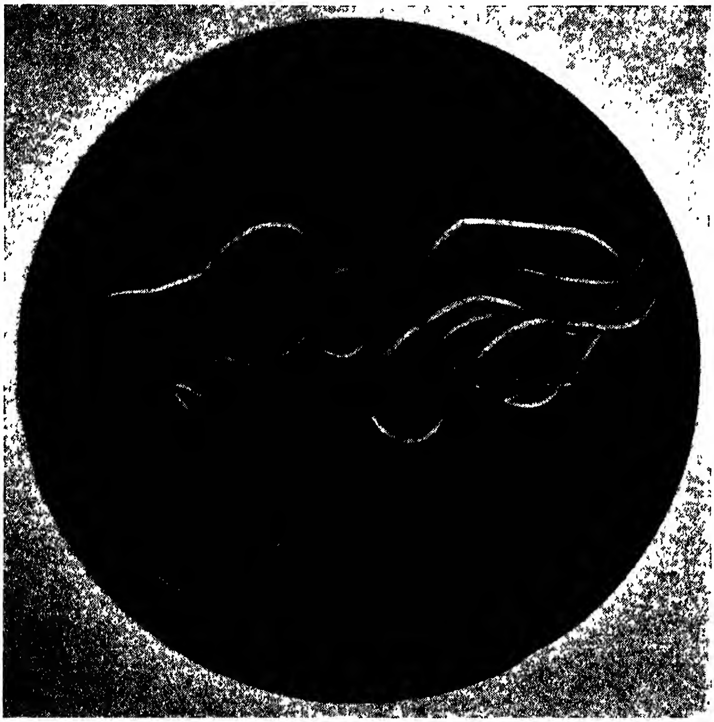


PLATE 11.—THE HEARTWORM OF DOGS (*Dirofilaria immitis*). Natural size.

Treatment and Control.

Two drugs are available for the treatment of heartworm in dogs—namely, "Fouadin" and sodium-antimony-111-bis-pyrocatechin-disulphonate of sodium. The use of these is rather complicated and is best left to the qualified veterinary practitioner.

Prevention consists of attention to the control of the particular species of mosquito and fleas responsible for carrying the larvæ and any other measures which will prevent the dog being bitten

TAPEWORMS.

TAPEWORMS OF THE DOG.

Several different species of tapeworms are found in the small intestine of the dog. These vary tremendously in size, one species being only ½ inch long while others attain a length of 15 feet or more. They are all armed tapeworms, that is, the head is provided with hooks which

enable the worm to grasp the wall of the intestine and maintain its position in this part of the alimentary tract. The segments containing the ripe eggs become detached from the body of the worm and are voided in the fæces of the dog. These eggs must then be swallowed by another animal, known as the intermediate host, before the life cycle of the tapeworm can be completed. Man, sheep, cattle, horses, pigs, rabbits, fleas, &c., may all play the part of intermediate host for the respective species, and in these animals the life cycle stage is known as a bladder worm, which is really a larval tapeworm. This is a cyst-like body filled with fluid. The dog then becomes infested, when it eats portions of these animals which contain these bladder worms.

The most important dog tapeworm is the hydatid tapeworm *Echinococcus granulosus*, which in the adult stage is only about ½ an inch long. Almost any mammal may act as an intermediate host for this tapeworm, including man and his livestock. In these animals, the bladder-worm stage is usually found in the liver or lungs, and in man, hydatids, or infestation with the bladder-worm, which may grow as big as a child's head, is a serious and frequently fatal disease.

The adult tapeworm is more prevalent in country dogs than in city dogs, due to the less strict supervision given the disposal of the organs containing the larval stage in the country and station slaughter-house.

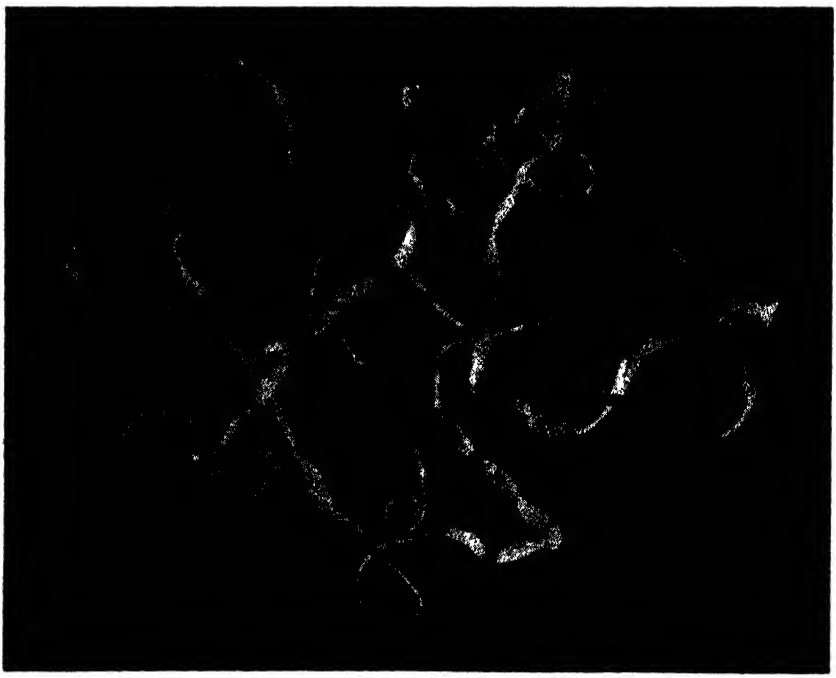


PLATE 12.—THE DOUBLE-PORED TAPEWORM OF THE DOG (*Dipylidium caninum*). Natural size.

All such offal should be thoroughly cooked before being fed to the dog, and so long as the dog receives raw liver, lungs, &c., hydatids will always be fairly prevalent in man.

The so-called "hydatids" in rabbits bears no relation to hydatids in man and is the larval stage of *Taenia pisiformis,* another dog tapeworm, the rabbit being the intermediate host of this species.

The most common tapeworm found in the dog is the double-pored tapeworm, *Dipylidium caninum* (Plate 12). This species is whitish or pinkish in colour and its segments are much longer than broad. The double-pored tapeworm may be spread by the dog flea, *Ctenocephalides canis,* or the biting louse *Trichodectes canis.* The flea becomes infected in the larval stage, the larvæ swallowing the eggs of the tapeworm present in the dust and dirt in which they live. The biting louse swallows the eggs on the contaminated skin of the dog. In the flea and louse the eggs develop into a bladder-worm and the dog becomes infested when it eats either of these insects. One of the principal measures in the control of this tapeworm is, therefore, keeping the dog free from fleas and lice.

Frequently in the body cavities of sheep, and sometimes cattle and pigs, one sees small bags of fluid suspended from the mesentery. This is the larval stage of another dog tapeworm, *Taenia hydatigena.*

Gid, which is a serious disease of sheep in Europe and America, and fortunately not present in Australia, is caused through the invasion of the brain of the sheep by the larvæ of the dog tapeworm, *Multiceps multiceps.* When the brain of an affected sheep is eaten by the dog, the larval forms develop into the adult tapeworm in the intestine of the dog.

Effect of Tapeworm Infestation on the Dog.

Heavy infestations are frequently conducive of nervous and digestive disturbances. Occasionally the worms may bunch together and form blockages in the intestine. There may be emaciation, and a very capricious appetite. Sometimes the voiding of the segments, especially those of the double-pored tapeworm, may cause itching of the anus, and to relieve this the dog may drag itself about on its haunches.

Treatment and Control.

Withhold all food overnight and next morning give arecoline hydrobromide in the following dosages:—

Small dogs	$\frac{1}{8}$ to $\frac{1}{4}$ grain
Medium dogs	$\frac{1}{4}$ to $\frac{1}{2}$ grain
Large dogs	$\frac{1}{2}$ to 1 grain

The drug is most conveniently given in a small quantity of water. Before treatment is attempted the stomach must be empty, otherwise the animal will vomit, and the efficiency of the treatment may be greatly reduced. Arecoline hydrobromide is very prompt in its action and the worms may be passed in twenty to thirty minutes after administration. No food should be given till three hours after treatment.

These dosages should be reduced for animals in a weak condition, and in such cases it would be safer to use kamala, freshly-ground areca nut, or oleoresin of male fern.

The preventive measures for the control of the dog tapeworms have already been discussed, but for the sake of emphasis are repeated:—

1. Keep the dog free of all fleas and lice.
2. Never feed raw offal to a dog; see that it is well cooked first.
3. When practicable all fæces should be removed promptly.

TAPEWORMS OF THE CAT.

Three species of tapeworms may be found in the intestine of the cat—namely, the cat tapeworm, *Taenia taeniaeformis;* the broad tapeworm, *Diphyllobothrium mansoni* (Plate 13) and occasionally the double-pored tapeworm of the dog *Dipylidium caninum.*

The cat tapeworm grows up to 2 feet in length. Its larval stage occurs in the livers of rats and mice, the cat becoming infested through eating these rodents.

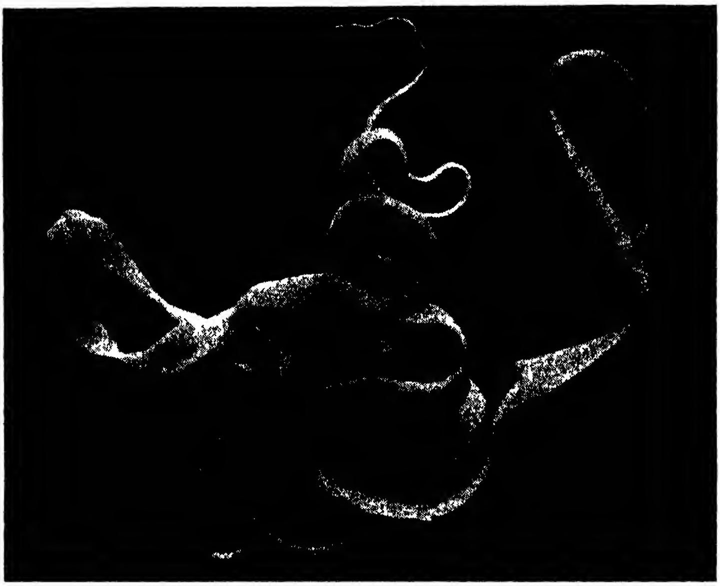


PLATE 13.—THE BROAD TAPEWORM OF THE CAT (*Diphyllobothrium mansoni*). Natural size.

The broad tapeworm (Plate 13) is a rather common species attaining a length of about 18 inches. It may be readily recognised by the series of spots in the middle of the segments. The life history of this species is unknown in Queensland, but it is thought that frogs may possibly fill the roll of intermediate host.

The effect of tapeworm infestation on the cat is similar to that given for the dog.

Treatment.

Kamala is used for removing tapeworms from cats. It is given in 10 to 15 grain doses to adult animals, either in a gelatine capsule or in syrup. The dose should be reduced for young and weak animals.

INSTRUCTIONS FOR THE FORWARDING OF PARASITES FOR IDENTIFICATION.

1. Internal Parasites—Worms.

(*a*) The specimens should be forwarded in methylated spirits. A suitable solution may be prepared by adding one volume of water to two volumes of spirits. On no account should the specimens be sent in water only, as the worms will quickly decompose without any preservative.

(*b*) When possible a number of specimens should be sent in order that both males and females be represented.

(*c*) Care should be taken in packing the container for postage. The Postal Regulations specify that sufficient packing be used to absorb any liquid that may escape through the container leaking or being broken.

(*d*) Accompanying the specimens full particulars of the following should be forwarded:—(1) The name of the animal in which the parasites were found; (2) the locality and date; (3) the name of the internal organ infested, whether the lungs, stomach, intestine, liver, &c.; (4) whether the parasite was lying free, attached, or in nodule form; and (5) the condition of the animal affected.

2. External Parasites—Flies, Lice, Fleas, Mites, and Ticks.

Flies.—(*a*) When a good series is obtainable, some specimens may be sent in spirits; the remainder in small boxes packed securely in position with cotton wool and soft paper (tissue paper). If only one specimen is forwarded it should be packed in cotton wool or tissue paper. Care should be taken in packing the specimen securely to prevent any movement, as this would tend to destroy bristles and other small structures useful for the identification of the species. Maggots should be sent alive packed in sawdust or cotton wool, the packing being slightly damped.

(*b*) Fleas, mites, and lice are best forwarded in spirits.

(*c*) Ticks are preferred alive, though, if necessary, they may be sent in spirits or formalin. The males are required and these are usually to be found in the vicinity of engorged and attached females. A good series of specimens representing both adults and young is desired. Care should be taken in detaching ticks as headless specimens are useless for identification purposes. A small drop of kerosene applied to the tick will cause it to fall off the host in a very short time. A good, steady, and patient pull will also yield good results.

(*d*) In all cases the host, locality, &c., should be noted.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Myology of the Pig

By J. A. RHEUBEN, Inspector of Stock, Brisbane.

IN the "Queensland Agricultural Journal" of February, 1933, an article appeared entitled "Are Sows Better Baconers than 'Barrows'?" The conclusion arrived at in this article leads the writer to describe a muscle existing in the abdominal and pectoral wall of the male pig which is non-existent in the female.

Since the bacon usually preferred by consumers is that in which there is a generous admixture of lean with fat, the presence of an extra muscle in flitches from the male must in consequence give bacon from this sex preference while such a demand exists.

The accompanying plates, showing in (14) the sow opened along the median line and free from any suggestion of muscle, and in (15) a barrow opened similarly showing distinctly between x x the extra existing muscle, proves conclusively the superiority of barrows as baconers.

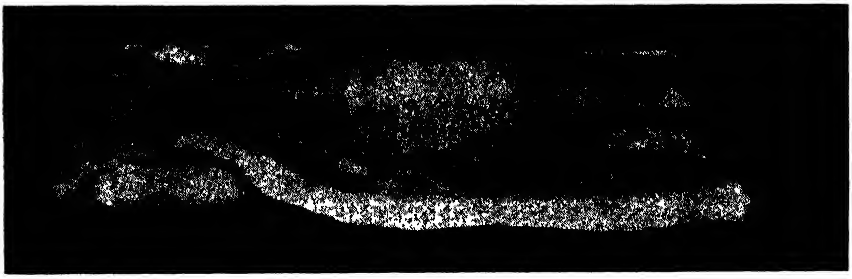


PLATE 14.

In 1933 the Royal National Association, in an effort to make comparison between the products of foreign exporters of bacon and that of our own State, imported flitches from Ireland, Sweden, Poland, Denmark, and Holland.

PLATE 15.

Photographs of these flitches appeared in the "Queensland Agricultural Journal," and on examination proved, without exception, to be from females. The photograph of the Queensland flitch, appearing in conjunction with the others, and selected by the writer, is of a barrow.

It would then appear that either the presence of this muscle has escaped the notice of various responsible persons in other parts of the world, or is quite unknown to them. This would, of course, mean that in competition on a market supplied by the bacon of barrows they would consistently take second place.

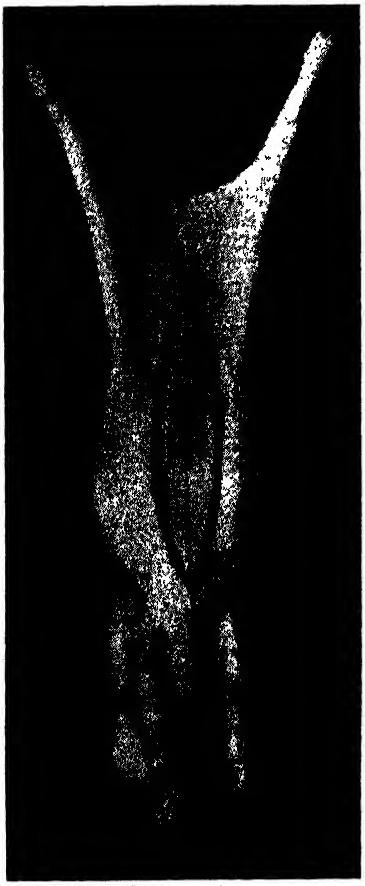


PLATE 16.

Location.—The muscle is situated along the inferior wall of the abdomen, having its anterior insertion at or about the fifth rib, reaching its maximum width of about 8 inches at the umbilicus, and having its posterior insertion at a point in line with the thin flank.

Plate 14 is of a flitch from a sow, and shows no subcutaneous muscle; such as is easily distinguishable in Plate 15 and which is marked x x. This latter photo. shows clearly the extent and location of the muscle, while in Plate 16 the pencil lines show still further its position. In Plate 16 the cross on the median line shows the position of the umbilicus.

After conversation with several veterinarians, and after a careful perusal of several text-books on anatomy, the writer has come to the conclusion that this extra subcutaneous muscle is either unknown or has not been described.

From the carcase point of view, the presence of this muscle is important. Hitherto the usual means of identification were the castration marks and the groove left on removal of the penis; these were removed in dressing, and such identification became difficult. The presence of this muscle, however, enables one to identify the carcase by the flitch.

The writer would be pleased if persons interested would communicate with the Chief Inspector of Stock and inform him if, in their experience, the muscle has been described, and the name of the particular publication.

PLATE 17.—REMOVING SILT FROM DAM, CAMERON DOWNS, HUGHENDEN DISTRICT.

Apple Packing for Export and Home Markets.

By JAS. A. GREGORY, Instructor in Fruit Packing.

PART I.

Export.

THE products of the apple industry of Australia have now become firmly established on the world's markets and meet with the keenest competition with the produce of other lands. It is necessary for all orchardists to adopt the latest methods if we are to keep up with the keen competition offered. To do this we must study all phases of harvesting and packing and use all our skill in producing a finished article that will hold its own in respect to maturity, quality, pack, and attractiveness.

Harvesting.

All apples are not suitable for exporting, and only lead to trouble and loss when sent away. It takes the whole year to grow a case of apples. Why spoil the whole of the labour by carelessness during the last operation? Variety, of course, plays a large part in successful export, early soft varieties, such as Carrington, Gravenstein, and William's Favourite being totally unsuitable. The old rule of "quickly matured, quickly bad," appears to prevail, only the late, long-maturing varieties such as Granny Smith, Stewart's Seedling, and Dunn's giving the best results. Jonathan, Delicious, and some of the other midseason varieties still present a problem in the Stanthorpe district. Codling Moth, Fruit Fly, and Bitter Pit are the main causes of trouble which can be to a great extent eliminated before packing. Growers, by studying the various trees in their orchards, can assist to a great extent in this disease elimination. It is unwise to pack for export from trees which show a high percentage of Codling Moth infestation unless the fruit is immediately cold-stored. It is quite possible for eggs laid on the fruit to develop after packing and cause damage to the consignment. White Oil as an ovicidal spray is an assistance, but has the effect of "fixing" the arsenate of lead residue firmly to the fruit, making it very hard to remove by wiping or other means. Fruit Fly is combated by growers using the ordinary means of control at hand and by exercising care in not packing under artificial light. Care in rejecting during picking is of great assistance and should be practised. "If in doubt throw it out" is a splendid motto to live up to. It is much easier to detect Fly under the natural sunlight whilst picking than whilst packing. It is the picker's job to reject, not the packer's. Bitter Pit, or Stippen, or Cork, as it is sometimes called, is a disease that gives most trouble of all in export consignments. Assisted greatly by immaturity, this disease develops during transit and in storage. Close attention to maturity is necessary. Most growers are rather prone to pick apples on the "green" side, forgetting about the development of Pit. Whilst there are many guides to maturity they are mostly internal guides and unsatisfactory, as all the apples on a tree do not mature at the same time, and whilst some fruit will test alright a high percentage will not. The best guide for the grower appears to be the change in the ground

colour of the individual fruit. Apples naturally green in colour become a brighter and lighter green in colour. Red apples change from a dull reddish ochre colour to a brighter and more crimson red, whilst red and green varieties show a combination of the two changed colours as mentioned. A pressure tester is used for testing maturity in some parts of the world, but has not altogether proved a reliable guide. The darkening of the pips is a sign of maturity, but not always an infallible test, as a dry period of weather will often induce a false maturity by changing the colour of the pips in immature apples. The texture and colour of the flesh when cut and the time it takes for the flesh to go black after cutting are also good guides. The more mature an apple is the longer the flesh takes to go black when cut. The Council for Scientific and Industrial Research, in its Bulletin No. 41 on "Bitter Pit of Apples," gives the following formula for a chemical test:—

Iodine solution for Starch Detection.—

Dissolve 1 gm. potassium iodide and 0·25 gm. iodine in 100 c.c. water, by gently heating if necessary.

Freshly-picked apples are cut across the centre and the fruit applied to the iodine solution. An iodine-starch reaction takes place, causing a discoloration of the flesh of the fruit. Immature fruit shows a greater discoloration than matured fruit, whilst over-matured apples show only a slight discoloration. As these tests are internal they, of course, are not altogether satisfactory from the grower's point of view. Growers are strongly advised not to attempt to export apples from trees carrying only a light crop or from young trees carrying their first normal crop. Mature aged trees will always give the most satisfactory results.

Over-maturity is, late in the season, a thing to be avoided. Green or semi-green apples coloured, such as Granny Smith or Jonathan, which show a change to yellow in the ground colour, should not be packed for export overseas, whilst varieties such as Dunn's and Sturmer which have gone yellow should be carefully tested for over-ripeness. Overseas buyers do not like yellow apples or badly coloured Jonathans, even if they do arrive in a saleable condition. Close attention to these points should assist in making the packing faster and better.

All fruit picked without stalks should be rejected from export consignments, as a large percentage of this fruit will possibly develop rot in the stalk cavity. Tests have proved this. This fruit can be marketed locally without waste of time with more satisfactory results. Granny Smith is a variety prone to shedding its stalk when being harvested, so extra care should be taken when picking. Scald, a cold-storage and transit disease which devlops often in Granny Smith apples, is hard to completely control. The use of oiled wrappers has been proved of great assistance, whilst sweating has also been known to have a beneficial effect.

Sweating.

It is best to get all varieties packed and on the boat as soon as possible after harvesting, with perhaps a possible exception in Granny Smith, which has given satisfactory storage results when sweating has

been practised with quantities stored until August. At the same time it must be remembered that ship storage under difficult conditions for keeping temperatures is vastly different from our established land cold stores; so it is recommended that until something more definite is available growers should endeavour to have the fruit on the ship as soon after harvesting as possible.

Cooling.

Care should be taken to let all fruit cool off after picking, before packing. This is absolutely essential if the fruit is to carry successfully for any distance.

Grading.

This operation is often confused with sizing operations. Grading is actually the sorting of fruit into grades of quality. Growers are advised to pay close attention to this operation, which should be carried out during picking operations. The absence of Black Spot (*Venturia inæqalis*) of the apple in Queensland makes it very easy to grade for quality. Colour standards in export consignments are now used. Grade designations for export have been altered, the use of the titles "Special," "Standard," and "Plain" being replaced by the designations Extra Fancy and Fancy. Colour requirements as follows have been adopted.

Colour Requirements for Various Varieties of Apples.

Solid Red—70 per cent. colour Extra Fancy (35 per cent. Fancy). Varieties: Democrat, Duke of Clarence, McIntosh Red, and King David.

Partial Red—50 per cent. colour Extra Fancy (20 per cent. Fancy). Varieties: Crofton, Geeveston Fanny, Jonathan, Worcester, Pearmain, Yates, Aromatic, Delicious, King Cole, Dougherty, Scarlet, Rokewood, Australian Beauty, Tasman's Pride, Coleman, and Jubilee.

Striped Varieties—30 per cent. Extra Fancy (10 per cent. Fancy). Varieties: Alexander, C.O.P., King Pippin, Pomme de Niege, Ribston Pippin, Statesman, Crow Egg, Nickajack, Prince Alfred, Rome Beauty, Stayman.

Uniform Colour for Variety—Cleopatra, Newtown Pippin, Sturmer, Stone Pippin, French Crab, London Pippin, Mobbs Codlin, Reinnette du Canada, Stewart's, Schroeder, Alfriston, Dunn's, Granny Smith, Wellington, White Winter Pearmain.

Varieties.

A multiplicity of varieties is not recommended for export. The following varieties from Stanthorpe give the best results:—Granny Smith, Stewart's Seedling, Alfriston. Care must be exercised when exporting Jonathan, Delicious, and similar varieties.

The tendency of the export trade is to eliminate many varieties, and good work has already been done in this direction. The following

are the present varieties permitted and the abbreviations of names of fruit which may be used on the cases:—

Method of placing wires around the case. Note bulge on fruit.

Method of placing wiring machine. Observe the amount of overlap allowed the handle of the machine. This allows free movement whilst the wire is being tightened.

List of varieties for export in 1935, together with colour requirements and abbreviations. ("Ex F." means Extra Fancy, and "F" Fancy; "E.C.," even colour):—

DESSERT, $2\frac{1}{4}$–$2\frac{3}{4}$ INCHES.

Variety.	Colour. Ex. F. %	F. %	Abbreviation.
3 Aromatic	50	20	ARO.
1 Cleopatra	E.C.	E.C.	CLEO.
1 Delicious	50	20	DEL.
1 Dougherty	50	20	DHTY.
2 Geeveston Fanny	50	20	G.F.
1 Newtown Pip	E.C.	..	N.T.P.
2 Ribston Pip	30	10	R.P.
1 Rokewood	50	20	ROKE.
1 Sturmer*	..	E.C.	ST. P.
1 Statesman	30	10	STN.
3 Australian Bty.	50	20	A.B.
Ex. White Winter Pearmain	E.C.	E.C.	W.W.P.
Ex. Stayman	30	10	STAY.
Ex. Coleman	50	20	CMN.
Ex. McIntosh Red	70	35	McINTOSH RED.
Ex. Jubilee	50	20	JUB.
Ex. King Cole	50	20	K.C.

*Note.—Russet Tolerance.

DESSERT, 2–$2\frac{1}{2}$ INCHES.

1 Cox's Orange Pippin	30	10	C.O.P.

DESSERT, $2\frac{1}{8}$–$2\frac{3}{4}$ INCHES.

2 King Pippin	30	10	K.P.
1 Crofton	50	20	CROF.
1 Jonathan	50	20	JON.
3 Pomme de Niege	30	10	P.D.N.
2 Worcester Pm.	50	20	W.PM.
1 Yates	50	20	YATES
2 King David	70	35	K.D.
2 Scarlet	50	20	S.PM.

CULINARY, $2\frac{3}{8}$–3 INCHES.

1 French Crab	E.C.	E.C.	F.C.

CULINARY, $2\frac{1}{2}$ 3 INCHES.

2 London Pip	E.C.	E.C.	L.P.
3 Mobb's Codlin	E.C.	E.C.	M.C.
3 Reinnette du Canada	E.C.	E.C.	R.D.C.
1 Stewarts	E.C.	E.C.	SS.
2 Schroeder	E.C.	E.C.	SCH.
Ex. Wellington	E.C.	E.C.	WTN.

CULINARY, $2\frac{1}{2}$–$3\frac{1}{4}$ INCHES.

1 Alfriston	E.C.	E.C.	ALF.
2 Prince Alfred	30	10	P.A.

DUAL PURPOSE, 2¼–3 INCHES.

	Variety.	Colour.		Abbreviation.
		Ex. F. %	F. %	
2	Alexander	30	10	ALX.
2	Crow Egg	30	10	C.E.
2	Duke of Clarence	70	35	D.C.
1	Dunns	E.C.	E.C.	DUNNS
1	Granny Smith	E.C.	E.C.	G.S.
2	Rome Beauty	30	10	R.B.
2	Nickajack	30	10	N.J.
2	Tasman's Pride	50	20	T.P.
2	Stone Pippin	E.C.	E.C.	S.P.
	DUAL PURPOSE, 2¼–3½ INCHES.			
1	Democrat	70	35	DEM.

E.C. indicates the *contents of a case must be of even colour.*

Varieties are numbered to indicate their classification as export apples.

No. 1 varieties recommended for export.

No. 2 varieties permitted to be exported, but it is not recommended that trees be converted to these varieties.

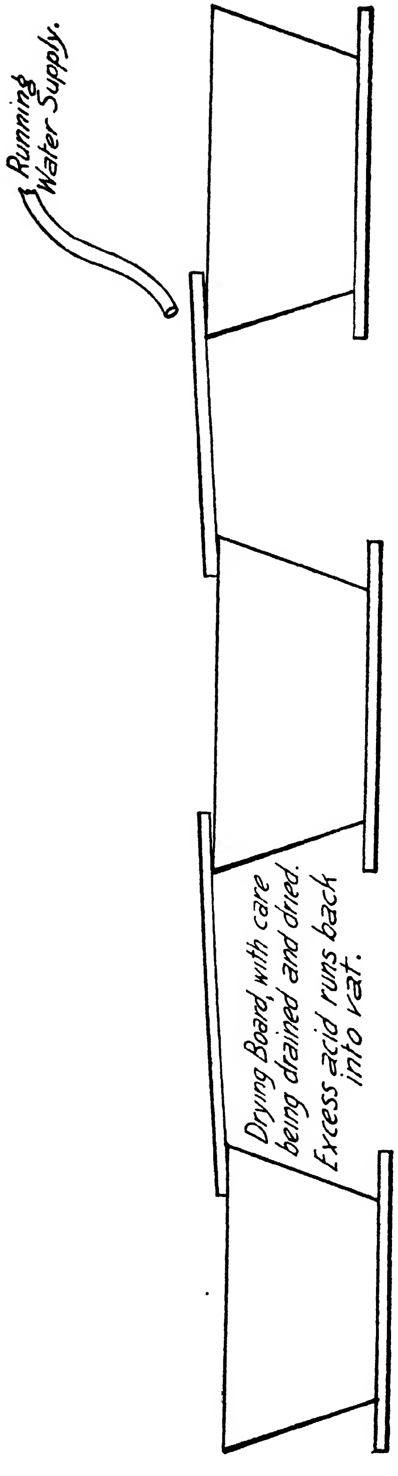
No. 3 varieties permitted to be exported for next two years, but any of these may be subsequently deleted from the export list.

Ex., Experimental.—Varieties permitted to be exported in 1935 in an experimental way, and to be the subject of reports by departmental officials and the fruit trade abroad.

Arsenate of Lead.

Growers are not permitted to export apples which carry too high a percentage of Arsenate of Lead. As mentioned before, Oil spraying in conjunction with Arsenate of Lead has the tendency to fix the lead, consequently making it harder to remove. Any quantity of Arsenic (Arsenious Trioxide As_2O_3) over 0·01 grams to the pound of fruit is not permitted. Many growers use a system of wiping to remove the residue. A rag damped in a weak solution of white oil and water is useful. Arsenate of Lead may be removed by dipping the fruit in a solution of ½ to 1 per cent. of Hydrochloric Acid and allowing it to remain there for two minutes. The fruit is picked into picking boxes kept specially for the purpose. The system of dipping is as follows:—

Two large wooden troughs should be provided, one for the acid solution and one for rinsing water. These troughs should be large enough to hold a case of fruit without removing the fruit from the case. The acid solution is prepared and placed in the first trough (1 gallon of commercial Hydrochloric Acid (33 per cent.) mixed with 64 gallons of water will give a 1 per cent. solution of dipping fluid). The case of fruit is then placed, case and all, in this solution, which should be in sufficient quantity to cover the fruit, and gently kept moving up and down for one to two minutes. The fruit is then removed and placed on a draining rack, which permits the surplus acid to drain back into the acid bath. The fruit is then plunged into the water bath and thoroughly cleansed of acid. This bath (Plate 18) should be supplied with continuously running water. The fruit is then dried thoroughly and is ready for packing. To make the removal of the Hydrochloric Acid even more effective, a third bath of lime (1 lb. to 40 gallons) water) can be used with good effect. This has the effect of neutralising the acid. It is not necessary to rinse the fruit after using the lime bath. Fruit should be treated with this acid bath immediately after picking, so that the effects of the bath are not spoiled by the development of the natural wax



Vat 1.
Hydrochloric Acid. 1 gal. to 64 gals. water.

Vat 2.
Water continuously running for preference.

Vat. 3.
Optional for use. Lime, 1 lb. to 40 gals. water.

PLATE 18.—METHOD OF REMOVING ARSENATE OF LEAD RESIDUE.

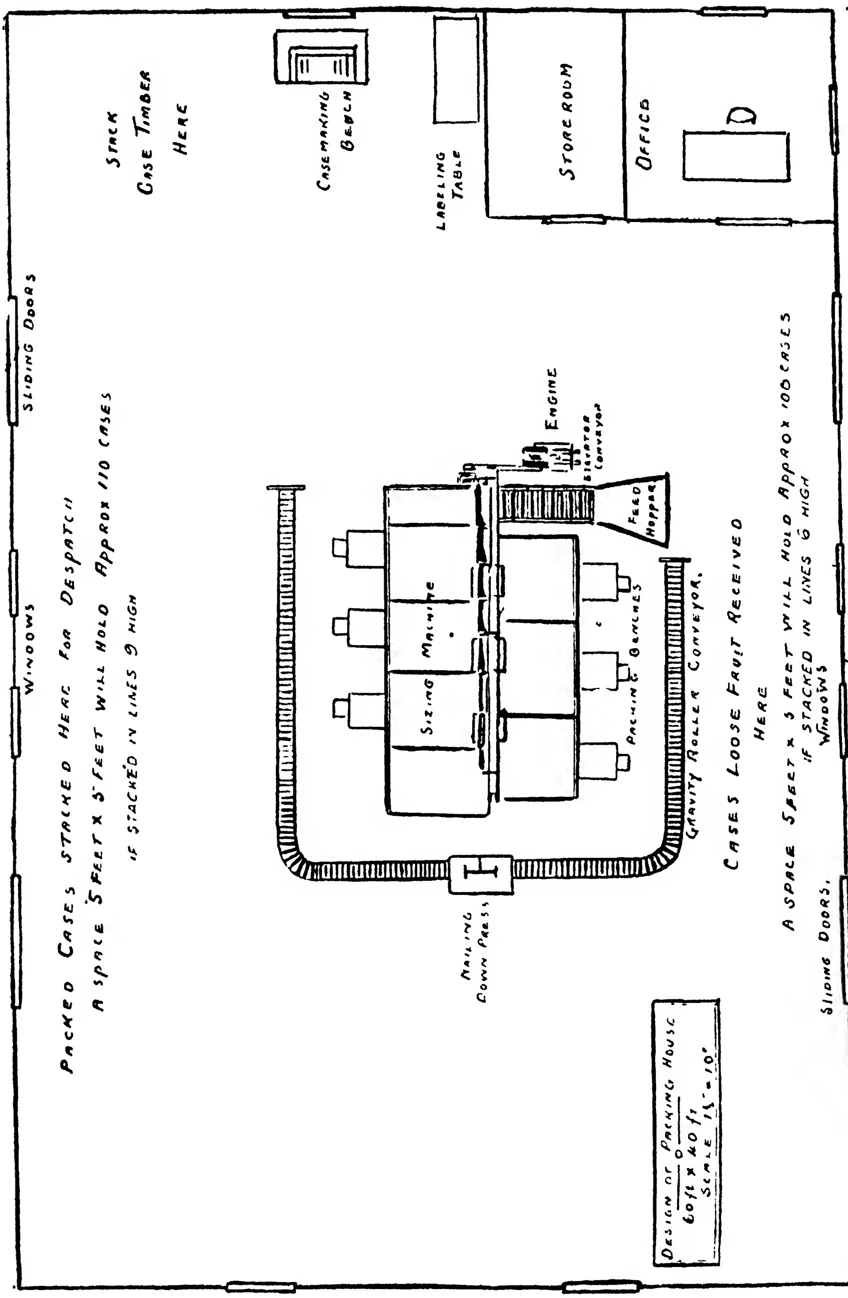


Plate 19 (Fig. 1).—Packing Shed Layout.

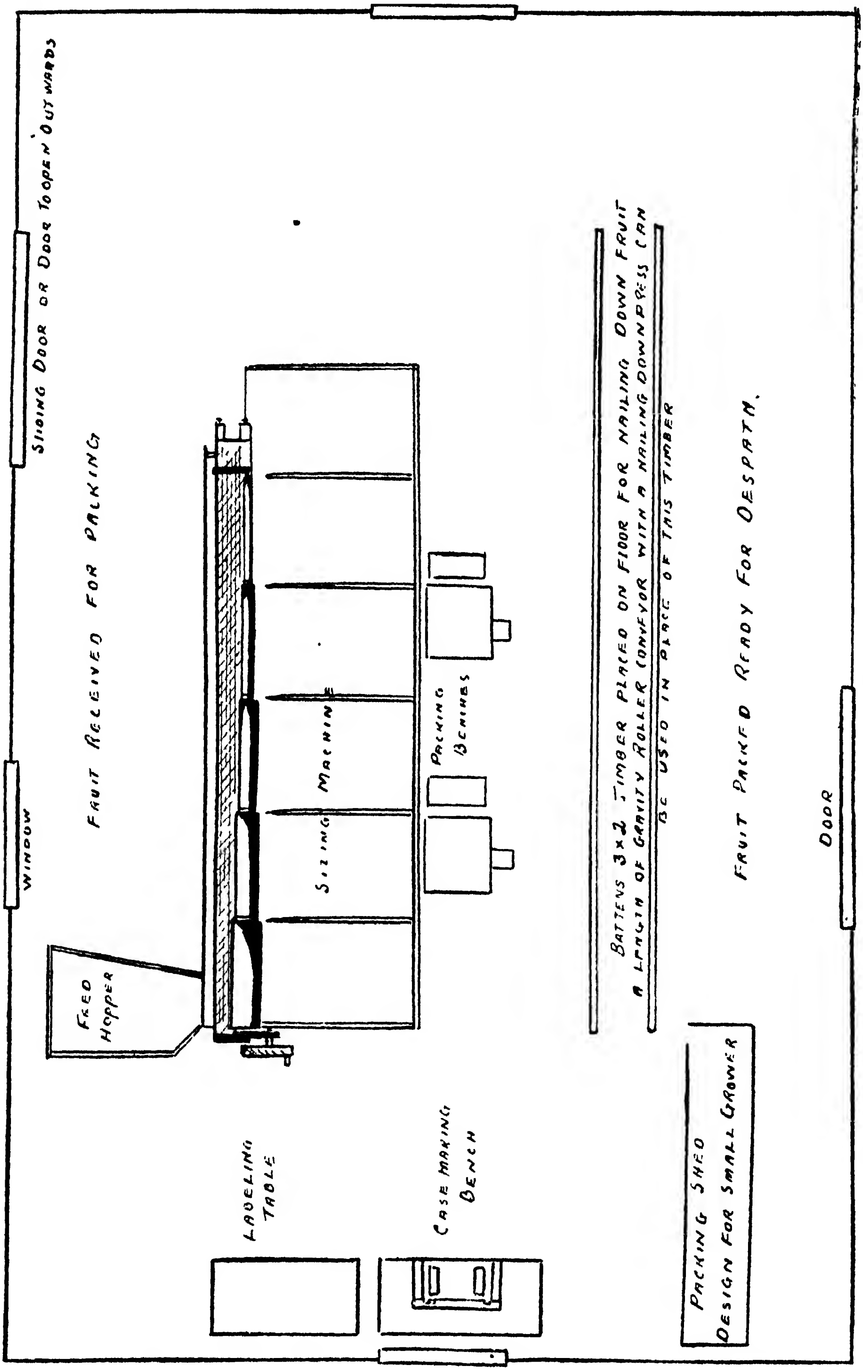
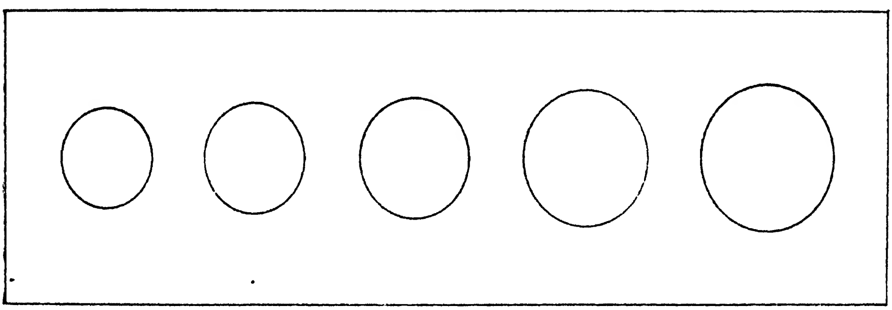


PLATE 20 (Fig. 2).—PACKING SHED LAYOUT.

on the fruit. The treatment is quicker and less costly than hand-wiping and usually adds to the attractiveness of the fruit. Care should be taken when the final lime bath is not used to thoroughly rinse the fruit, as if this is not done it is possible to seriously injure the fruit, the acid collecting in the calyx and stem cavities. Hydrochloric Acid is volatile and will eventually evaporate, but before doing so might injure the fruit. The injury appears as a bleaching of the skin, and shows a depressed area where damage occurs. Frequent changes of rinsing water, or, better still, running water, will overcome this risk. Where arsenic is present the spots turn black. A residue of acid can be readily detected by the tip of the tongue, the acid causing a sharp stinging sensation when coming in contact with the tongue. Care should be taken not to wash fruit with open calyx, as the acid is likely to cause damage to this type of fruit.

Shed Equipment.

Good packing-shed equipment helps to make the work easier and faster. In addition to the plant for washing, packing-shed plant is described. A suggested design for the layout of small packing sheds is given (Plates 19 and 20). This can be modified by growers to suit their own individual sheds. The main consideration is to keep the work moving in one direction, so that time is not wasted by walking around or dodging other work that is in progress. The following is a list of equipment to use in up-to-date Packing-houses:—Sizing Machine and Conveyor, Lidding Press, Case-making Bench, Packers' Stands with Paper Holder and Needle, Packer's Spring Boards, Nail Stripper, Case End Scraper, Stencils, Labelling outfit, including complete set of Rubber Stamps, Sizing Rings, and Roller Conveyors.



Scale. 1/4 Inch. = 1 Inch.

PLATE 21.—HAND-SIZING GAUGE.

The holes can be cut in the plywood with an expansion bit or washercutter, 1½ inch being the distance of the edge of the 3-inch hole from the edge of the board with a distance of 1¼ inch between the edges of each hole.

An up-to-date sizing plant is the first consideration. Apples are fruit that size well when sized by any of the usual commercial sizers, of which many satisfactory types are on the market. Growers will find that a sizing machine will soon repay its cost in time saved. Sizing plants can be procured from £20 upwards. A good case-making bench is another necessity. Many growers make case-making the hardest work during harvesting and marketing. Much time can be saved on case-making. Packing stands are time savers and soon repay their cost.

A lidding press is a well worth while addition to the equipment, particularly where the Standard case is being used.

A useful hand-sizing gauge (Plate 21) can be made from a piece of three-ply, 20 inches by 6 inches, with five holes cut in it with the following diameters:—2 inches, 2¼ inches, 2½ inches, 2¾ inches, and 3 inches. The packing counts can be written in alongside of each sized hole. The packer will find this gauge useful when first learning to pack. A description of how to make home-made packing-shed equipment is contained in a pamphlet issued by the Department of Agriculture and Stock, William street, Brisbane. This can be had free on application to the Under Secretary for Agriculture and Stock.

Containers.

Two different cases are used for marketing apples—the Standard case 18 inches long by 11½ inches wide by 10½ inches deep, and the Australian Dump case 18 inches long by 8⅔ inches wide by 14¼ inches deep. Fruit for export is best packed in the Standard box, as this case

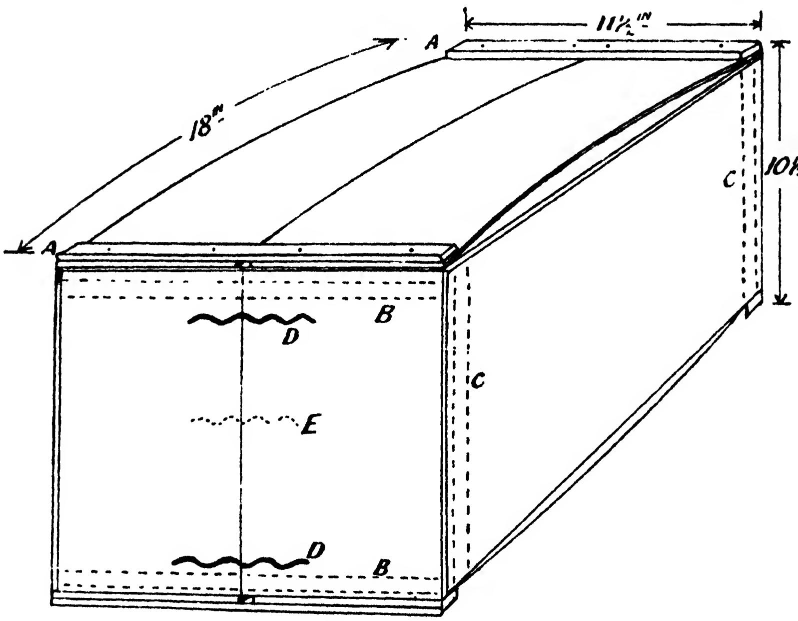


PLATE 22.—SKETCH OF CANADIAN CASE.

Correct method of making the Canadian Standard Case.

The cleats (A) are placed across the ends of the pieces of timber used for the tops and bottoms of the case, and are not used in the position indicated by the dotted lines (B and C). If growers are supplied with a case with two-piece ends, it is suggested that corrugated fasteners (D and E) be used instead of the cleats (B) indicated. Two fasteners (D) to join the two pieces should be placed on one side of the end about 1 inch from either edge, and one fastener (E) in the middle on the opposite side of the end.

is used by all the exporting countries of the world, United States, Canada, New Zealand, and South Africa. This case is also used by English and Irish apple growers to market their fruit on the British markets. The Australian Dump case is used by no other country but Australia. Some

of the States use this case for the Australian trade only, using the Standard case for all export consignments. It will be seen that on the overseas markets the Standard case is, on account of being used generally, the best commercial package for use. From the point of view of the packer the respective merits of both cases are interesting. Both cases lend themselves to doing the diagonal cheek pack to perfection. The Standard case, being wider, gives the packer more room for working, enabling him to work faster and increase his output. It has a better display value than the Dump case, having a larger face of fruit for display when used for this purpose. Properly made, it takes less nails, requiring thirty-two nails as against forty for the Dump case. Both cases, being the same length, permit of regular stacking in trucks, &c. Care should be exercised by casemakers not to drive the nails through the boards too close to the edges, ⅝ to ¾ inch from the edge being necessary. (Plate 22.) This will, to a large extent, prevent the splitting of boards. Use 1¼-inch 14 gauge nails if nailing across the grain, and 1½-inch if with the grain for sides, and 1½-inch 14 gauge for top and bottom. Drive all nails on the scew. The following are the timber specifications for the Standard and Dump cases as required by the Commonwealth Department of Markets before the cases can be used for export purposes:—

Standard Case.

2 Ends, 11½ inches x 10½ inches x inch thick.

2 Sides, 19¼ inches x 10½ inches x $\frac{5}{16}$ inch (min.).

4 Tops and 4 bottoms, 19¼ inches x 5½ inches x $\frac{3}{16}$ inch.

2 Cleats, 11½ inches x ¾ inch x $\frac{5}{16}$ inch (min.).

Dump Case.

2 Ends, 8¾ inches x 14¼ inches x ⅝ inch thick.

4 Sides, 19¼ inches x 7 inches x $\frac{5}{16}$ inch thick.

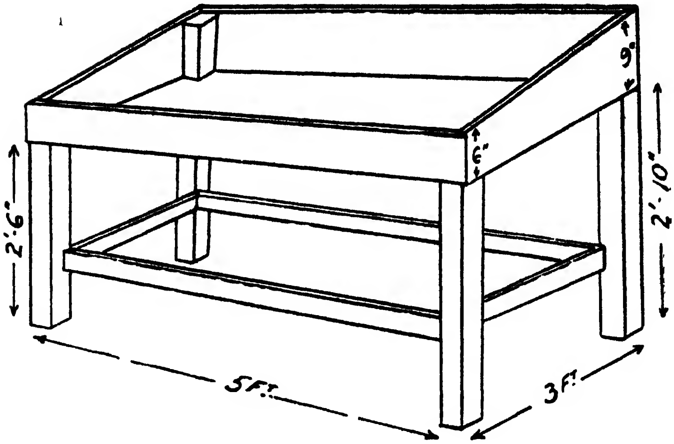
4 Tops and 4 bottoms, 19¼ inches x 4 inches x ¼ inch thick.

Single tops and bottoms are sometimes used, 19¼ inches x 8½ inches x ¼ inch thick.

Care should be taken to use only clean, new-seasoned timber for making cases. Softwood is to be preferred to hardwood timber. Casemakers should make sure that openings, between the boards, of not more than ¼ inch occur. Wider openings than this are likely to cut the fruit on the edges of the boards. It is also necessary to see that the top and bottom edges of the side boards are not placed more than ¼ inch from the top and bottom edges of the end pieces. This will prevent fruit from being cut on the edges of the sides when nailing. Having the ends dressed on one side is an improvement to the case.

Sizing.

Sizing the fruit before packing assists greatly in making packs easy to do and easy to bring to the correct height in the case, although there are packers who find no difficulty in packing unsized fruit by using a roomy bench (see Plate 23) to hold the fruit, tipping one case only on the bench at a time. The packer then packs two different sizes at the same time, and, while packing, sorts the remaining sizes into separate heaps on the bench. Growers who are fortunate enough to have a mechanical sizer will find the operation of packing made easy, provided that care is taken to avoid the pitfalls associated with mechanical sizers. Firstly, it should be remembered that in practically all mechanical sizing machines two different counts of fruit can be packed from each bin, packing being made very easy if this rule is followed. To enable this to be done, it is well to have packing stands of the type illustrated (see



Fruit Bench to assist in Grading.

PLATE 23.

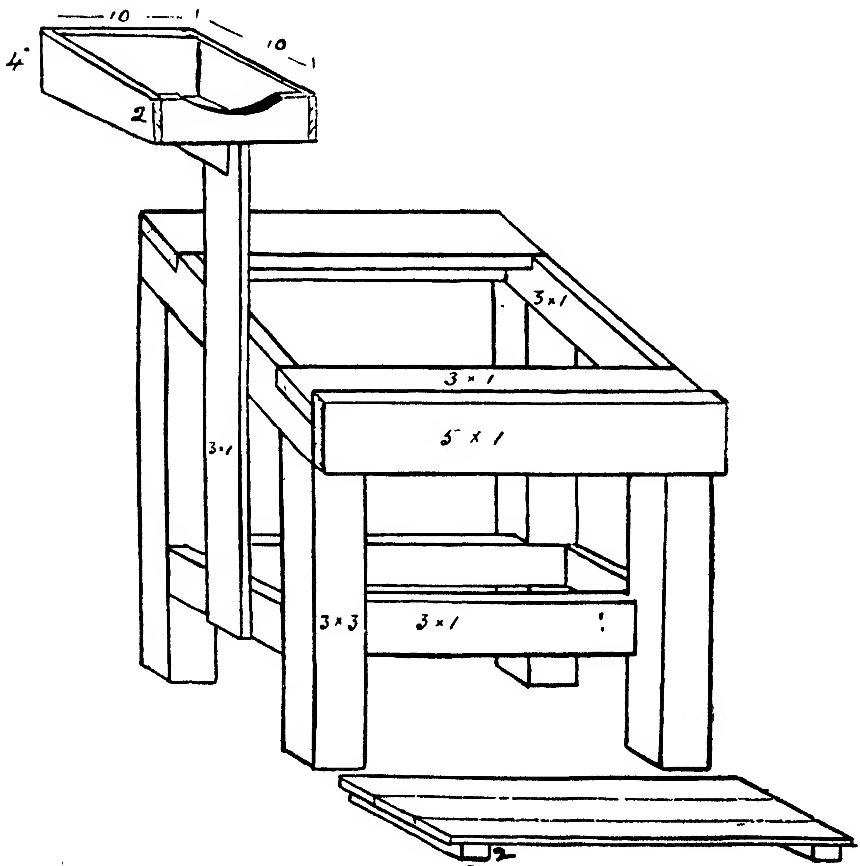


PLATE 24.—PACKING STAND.

Plate 24.) A spring-board of the type illustrated is also helpful in preventing packers from getting aching backs, tired feet, &c.

Fruit is always sized according to the measurement of its diameter, the following sizes being used:—2 inches, 2¼ inches, 2½ inches, 2¾ inches, and 3 inches. Under the Fruit and Vegetables Act no apples are allowed to be marketed in Queensland when under 2 inches in size. The size can be determined by having a sizing gauge as previously mentioned made with these diameters, the apple being placed on the ring with the stalk up. Any apple that will fall through a 2¼-inch ring but not through a 2-inch ring is classified as a 2-inch apple. Likewise, an apple that will go through a 2½-inch ring and not through a 2¼-inch is classified as a 2¼-inch apple. This method is repeated to determine all sizes. A handy gauge can be cut from a piece of three-ply with a washer-cutter or carpenter's expansion bit. (Plate 21.) A few weeks' experience will enable the packer to become so proficient that the use of the rings will become unnecessary. Packers are advised to always pack to a count instead of making up their minds that they will pack to an exact size. When using a mechanical sizing machine, best results are obtained by keeping the rollers at a marked setting, so that the same counts can be packed out of each bin for any particular variety or shape of fruit. After any alteration of the rollers or belts to pack other fruits, the machine can be set back to its original place and the same counts for any particular variety packed from the same bins.

Packing.

The standard diagonal cheek system of packing is best. This pack has the following advantages:—

All layers will come to an even height in the case. (Plate 25.)

A given size of fruit will always come to the correct height in the case.

The packed fruit will always look attractive, appearing in straight lines diagonally, across, and up and down the case, whether opened on the top, bottom, or sides.

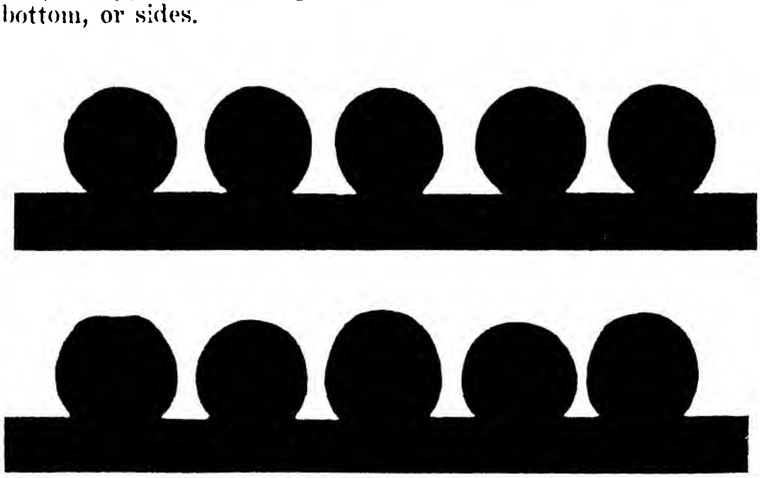


PLATE 25.

The same five apples photographed on their cheek as placed when doing the Standard Cheek pack, and on their stalks as they would be placed when doing other packs. Note the unevenness of height in both layers. This explains the main reason why the cheek pack is preferred by packers.

No two apples will rest upon the other, but in the pockets formed between the fruit of the layer beneath.

The height of the fruit in the case can be governed by making the pockets larger or smaller.

The quantity or number of fruit in the case is always the same for each pack, and can be ascertained at a glance.

It is my intention to, as far as is possible, simplify the packing. With this end in view readers will find that the various packs that can be used have been divided into two groups. One group contains (Plate 28) a list of packs that should be found by packers to be all that is necessary to pack all sizes of most types of fruit. For the Standard case this list embraces (Plate 26) Apple Packs and Counts to use, all the counts that are used by the United States of America, Canada, New Zealand, South Africa, England, and Ireland when marketing on the British and Continental markets. The second group consist of packs (Plate 29) which packers might find of use when a different type of case, such as hardwood, is used. Growers should bear in mind that counts regularly used by the established packing-houses are better understood by buyers, and should use these in preference to intermediate counts.

A fault often noticed in private packing-sheds is the lack of any attempt on the part of packers to provide themselves with equipment to enable them to work fast and in comfort. Proper equipment in packing-sheds soon pays for itself in increased efficiency, enabling a larger output per day to be handled. A pamphlet, "Packing Houses and their Equipment," describing how to make shed equipment, for a small cost, at home during the quiet periods of the year, can be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

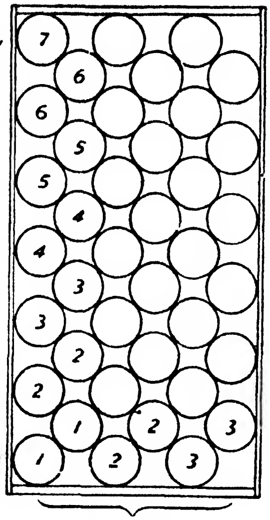
By using the packing-stand illustrated (see Plate 24) the cases are slightly tilted, which helps to keep the fruit in position, thus making the packing much easier. The packer stands with the two cases to be packed into in front of him, with the fruit on one side of the cases and the wrapping paper on the other. The bench with the fruit on should be made tilted to permit the fruit to run to within easy reach of the packer.

The two cases used for apple-packing can be packed correctly by using four different packs. For the Standard box, 18 inches long by 11½ inches wide by 10½ inches deep, the 3—3, 3—2, and 2—2 packs will pack correctly all commercial sizes of fruit. When packing the Dump case the 3—2, 2—2, and 2—1 packs are used. A reference to the packing chart, used in conjunction with a description of packs, will assist the beginner in understanding the difference between the different packs.

3-3 Pack. (See Plate No. 8.)

This pack is only used in the Standard box and is very easy to do if care is taken in placing the first six apples in the first layer. Three of these are placed in a layer across the end of the case with the stalks facing the end of the case farthest from the packers, the first fruit being placed in the left-hand corner and the other two being spaced equal distances apart between the corner fruit and the right-hand side

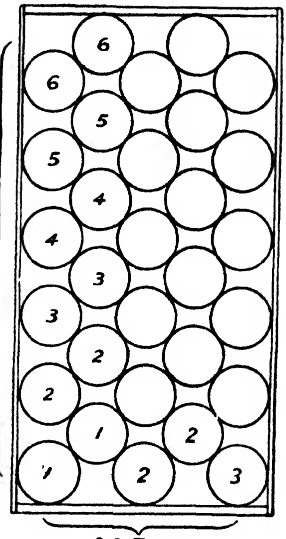
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 7 x 6.



3-3 PACK.

The Pack gets its name from the way the first six fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

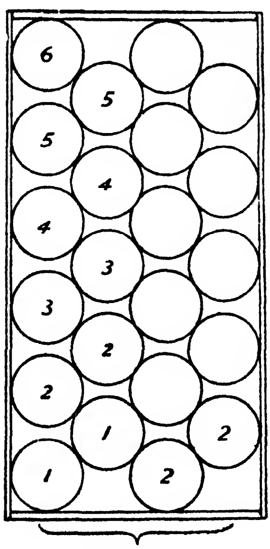
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 6.



3-2 PACK.

The Pack gets its name from the way the first five fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

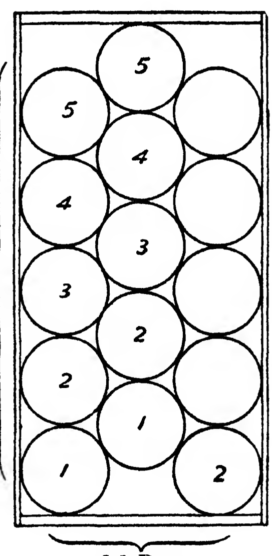
The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 6 x 5.



2-2 PACK.

The Pack gets its name from the way the first four fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

The Layer Count is obtained by counting in the first layer two alternate lines of fruit from end to end in the case, this layer count being 5 x 5.



2-1 PACK.

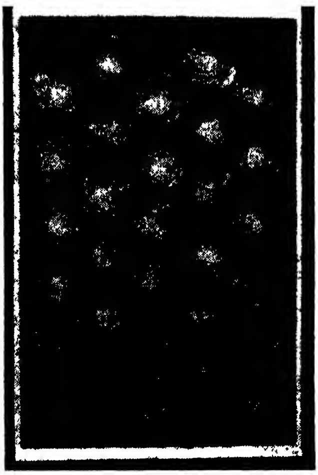
The Pack gets its name from the way the first three fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

PLATE 26.—HOW TO READ AND USE THE PACKING TABLE.

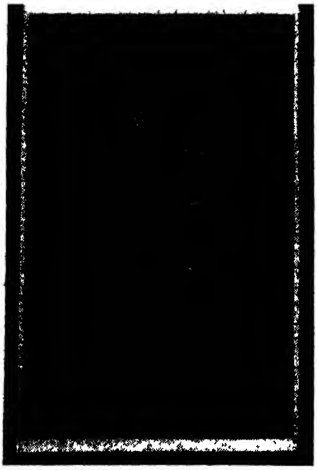
of the box, leaving three spaces of the same size. In the three even spaces between the fruit we place the next three apples, forming the 3—3 from which the pack gets its name. This is repeated until the layer is finished. Care must be taken to see that fruit is placed in straight lines. The layer is then completed by placing lines of three in the spaces between each line of fruit until the last line at the end of the layer is reached. The last three apples are then placed in position but reversed so that the stalk end is facing the packer. The second layer is packed in the same manner as the first, but is placed in the pockets or spaces of the first layer, the finished case requiring six layers to complete the

How to Start the Second Layer, 3-3 Pack.

How to Start the Second Layer, 3-2 Pack.



How to Start the Second Layer, 2-2 Pack.



How to Start the Second Layer, 2-1 Pack.

NOTE.—The Apples of the Second Layer fit into the pockets of the First Layer.

PLATE 27.—PACKING ILLUSTRATED.

pack. The same rule of placing the stalk end of the fruit inwards applies in all of the packs, as it prevents the end line of fruit when they are long-stalked varieties from having the stalks squeezed into the fruit by the pressure of the end.

3-2 Pack.

In the 3—2 pack the first layer is started by placing an apple in each corner of the case and one exactly midway between them facing end to end in the case, the stalks facing from the packer. In the Dump case all the stalks face the packer. This forms a line of three apples with two spaces, or pockets, between them. The pack is continued by placing two apples in these spaces, which leaves three pockets between the two apples. We repeat the placing of three apples in these pockets, and then alternately two and three until the layer is finished, except for the last line of fruit; this is reversed with the stalks facing the packer. To start the second layer place two apples in the pockets formed by the first three apples of the first layer, then two and three alternately, the stalks facing as in the first layer, until all the pockets of the first layer are filled, again reversing the last line of fruit across the case. This process is repeated layer by layer until the case is filled. The Standard case requires five layers, the Dump case seven, to complete.

2-2 Pack.

This pack is started by placing an apple in the bottom left-hand corner of the case and midway between this apple and the right-hand side of the box a second apple, leaving two pockets between the two in which the next two apples are placed, thus forming the 2—2 from which the pack derives its name. This is then repeated, the apples being placed facing as in the 3—2 pack until the layer is finished with all but the last line of fruit. In the Dump case all stalks face the packer; in the Standard case this is reversed. The second layer is started by placing two apples in the pockets formed by the first two of the first layer, the layer being finally finished by placing apples in all the pockets of the first layer and reversing the last line of fruit as in the first layer. By repeating this process layer by layer the case is finished. The Standard case is completed with four layers, the Dump case requiring six.

2-1 Pack.

This pack is used only for the Australian Dump case. The rule of placing the stalk end of the fruit to the packer applies. The pack is started by placing an apple in each corner of the case, which leaves a space between the fruit. A third apple is placed in this space or pocket, which gives us two and one, from which the pack derives its name. The process is then repeated to complete the layer. The second layer starts with one apple placed upon the pocket between the first two of the first layer, followed by two, one, two, until the layer is finished. The case is completed by repeating further layers in the manner of the first and second layers, packing until full, the case containing five layers when completed.

APPLE PACKS AND COUNTS TO USE FOR THE CANADIAN STANDARD CASE.

18 inches long x 11½ inches wide x 10½ inches deep.

Packs to use for Conical and Round Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2 inches	3—3	7—7	6	252
2⅛ inches	3—3	7—6	6	234
2¼ inches	3—3	6—6	6	216
2⅜ inches	3—3	6—5	6	198
2½ inches	3—3	5—5	6	180
2⅝ inches	3—2	7—6	5	163
	3—2	6—6	5	150
2¾ inches	3—2	6—5	5	138
2⅞ inches	3—2	5—5	5	125
3 inches	3—2	5—4	5	113
	3—2	4—4	5	100
3¼ inches	2—2	6—6	4	96
	2—2	6—5	4	88
	2—2	5—5	4	80
	2—2	5—4	4	72
	2—2	4—4	4	64

The counts are standard on the worlds markets, being used by United States of America, Canada, New Zealand, England, and Ireland.

Packs to Use for Flat Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2 inches	3—3	8—8	6	288
2⅛ inches	3—3	8—7	6	270
	3—3	7—7	6	252
2¼ inches	3—3	7—6	6	234
	3—3	6—6	6	216
2½ inches	3—2	8—8	5	200
	3—2	8—7	5	188
2⅝ inches	3—2	7—7	5	175
	3—2	7—6	5	163
2¾ inches	3—2	6—6	5	150
	3—2	6—5	5	138
3 inches	3—2	5—5	5	125
3¼ inches	3—2	5—4	5	113
3½ inches	2—2	7—6	4	104
	2—2	6—6	4	96
	2—2	6—5	4	88
	2—2	5—5	4	80
	2—2	5—4	4	72
	2—2	4—4	4	64
	2—2	4—3	4	56
	2—2	3—3	4	48

The counts are standard on the world's markets, being used by United States of America, Canada, New Zealand, England, and Ireland.

PLATE 28.—APPLE PACKS AND COUNTS.

Alternate packs may be used when packing hardwood cases, which do not bulge easily on the top and bottom.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2⅛ inches	3—3	9—8	5	255
	3—3	8—8	5	240
2¼ inches	3—3	8—7	5	225
	3—3	7—7	5	210
	3—3	7—6	5	195
2½ inches	3—2	6—6	6	180
	3—3	6—5	5	165
	3—3	5—5	5	150
2¾ inches	3—2	6—6	4	120
3 inches	3—2	6—5	4	110
	3—2	5—5	4	100
3¼ inches	3—2	5—4	4	90
	3—2	4—3	5	88

These packs should not be used at any time for export overseas.

PLATE 29.—ALTERNATE PACKS.

PACKS TO USE WHEN USING THE AUSTRALIAN DUMP CASE.

18 inches x 8⅝ inches wide x 14¼ inches deep.

FOR CONICAL OR ROUND APPLES.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2¼ inches	3—2	7—7	7	245
	3—2	7—6	7	228
	3—2	6—6	7	210
	3—2	6—5	7	193
2½ inches	3—2	5—5	7	175
	3—2	5—4	7	158
	2—2	7—6	6	156
	2—2	6—6	6	144
2¾ inches	2—2	6—5	6	132
	2—2	5—5	6	120
3 inches	2—2	5—4	6	108
3¼ inches	2—1	6—6	5	90
	2—1	6—5	5	83
	2—1	5—5	5	75
	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53

PLATE 30.—PACKS FOR AUSTRALIAN DUMP CASE.

Australian Dump Case Packs for Flat Apples.

Approximate Size.	Pack.	Layer Count.	Number of Layers.	Total.
2¼ inches	3—2	8—8	7	280
	3—2	8—7	7	263
	3—2	7—7	7	245
	3—2	7—6	7	228
2½ inches	3—2	6—6	7	210
	3—2	6—5	7	193
	3—2	5—5	7	175
	2—2	8—7	6	180
2¾ inches	2—2	7—7	6	168
	2—2	7—6	6	156
	2—2	6—6	6	144
	2—2	6—5	6	132
3 inches	2—2	5—5	6	120
	2—2	5—4	6	108
	2—1	7—7	5	105
3¼ inches	2—1	7—6	5	98
	2—1	6—6	5	90
	2—1	6—5	5	83
	2—1	5—5	5	75
	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53
	2—1	3—3	5	45

PLATE 30—*continued.*

A close examination of the packing-tables given will be of assistance. These will be dealt with separately for both cases. To simplify the packing as much as possible the packs will be divided into two sections for each case, one table giving the open pocket packs to use, the second giving the pocket packs which can be used but are not recommended.

Packing the Australian Dump Case.

The dimensions of the Australian Dump case are—18 inches long by 8¾ inches wide by 14¼ inches deep. The timber for this box should be cut with the sides of a minimum thickness of five-sixteenths of an inch, with the tops and bottoms a quarter of an inch thick. Unlike the Standard box, no cleats are used. The finished case should have a bulge of ½ inch to 1 inch on the top and bottom of the case when packed. Three packs are used to pack this box—the 2—1, 2—2, and 3—2.

By calculating the height the fruit will come to in the case two or three layers before the top is reached, the packer, by applying the rule "The size of the pockets governs the height of the fruit in the case," can bring the fruit either higher or lower as required. This is done by making the pockets smaller by slightly increasing the size of the fruit and placing it on a bigger angle, bringing the fruit higher in the box to correct a pack which will come too low, or, in the case of a pack that is coming high, to open the pockets by reducing slightly the size of the fruit and placing it more at right angles to the side of the box. Usually the fault of the fruit coming to the wrong height is caused by a variation in sizing the fruit in the subsequent layers after placing the first layer into

position. Cases not of the correct width are often the cause of trouble in bringing the pack to the correct height, but by following the rule governing the size of the pockets this difficulty may generally be overcome satisfactorily. It should be remembered that it is an offence against the Fruit and Vegetables Act to market fruit in under-sized cases. The Export Regulations also control the size of cases used.

THE SAME FRUIT.

Both cases opened on the side.

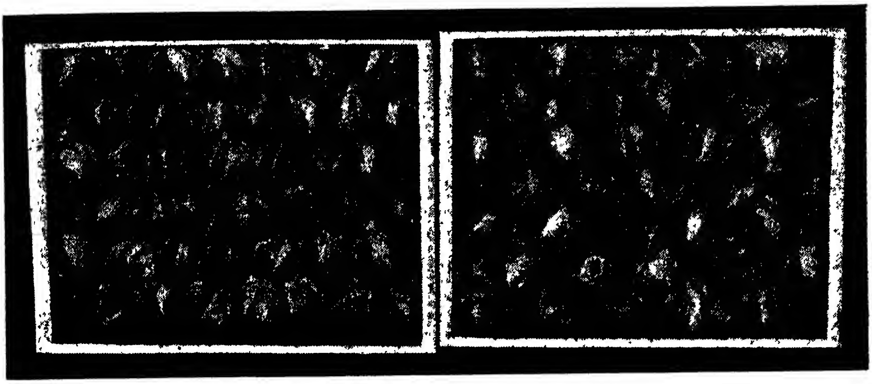


PLATE 31.—SIDE VIEW OF PACK.

Count 175, 3-2 Pack.
CORRECT HEIGHT.

Count 168. 2-2 Pack.
Note space between top layer and lid.

2½ inch apples, round or conical in shape, will not come to the correct height when packed 2-2 pack, 7-7 layers, count 6 layers 168, but if packed 3-2 pack, 5-5 layer count 7 layers 175, no trouble should be experienced.

THE SAME FRUIT.

Both cases opened on the side.

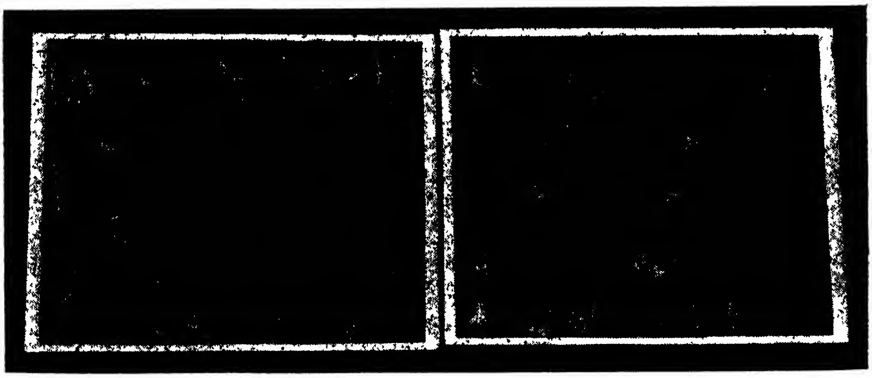


PLATE 32.—ANOTHER SIDE VIEW.

2-2 Pack, 5-4 Layer.
Count 6 Layers.
Correct Pack.

2-1 Pack, 7-7 Layer.
Count 5 Layers, 105.
Low Pack.

3 inch apples packed 105 count 2-1 with 6 layers is too low, but when packed 2-2, 5-4, 108 count comes to the correct height. Compare height of fruit with distance from lid.

Packing the Standard Case.

The Standard case is more convenient to pack than the Dump case, allowing the packer more room to work, due to its extra width. Care should be taken to see that the timber specifications are strictly adhered to, as the whole success of the case depends on its being correctly milled and made up. The 3—3, 3—2, and 2—2 packs are used to pack this box. The finished case should be packed 1½ inches above the top of the case at the centre of the layer with a natural bulge being formed causing the ends to be lower than the centre. Where the case is packed on a packing-stand that does not permit the bottom of the case to bulge slightly while being packed the height of the centre of the top cover above the top of the case should be up to 2 inches. A bulge of this size will give a complete bulge top and bottom of approximately 1 inch when nailed down.

Packing for Local Market.

The same attention to detail should be given to packing for local market. Cases are sometimes lined with clean white paper, but this is unnecessary where wrapping is practised and cardboard guards are used. If corrugated cardboard guards are not used unwrapped fruit should be packed in paper-lined cases to prevent case pressing and rubbing. Clean plain white or coloured paper should be used. Wrapping is always recommended in preference to packing fruit without wraps.

Case-marking Abbreviations for Apples.

The following case-marking abbreviations for apples have been arranged by Australian Departments of Agriculture:—

Variety.	Abbrev.	Variety.	Abbrev.
Adam's Pearman	A.P.M.	London Pippin (Five Crown)	L.P.
Alexander	ALEX.	Lord Nelson	L.N.
Alfriston	ALF.	Lord Suffield	L.SF.
Allington	ALN.	Lord Wolseley	L.W.
Aromatic	ARO.	McIntosh Red	McRED.
Ben Davis	BEN D.	Mobb's Codlin	MOB.
Bismarck	BIS.	Newtown Pippin	N.P.
Black Ben Davis	B.B.D.	Nickajack	NICK.
Buncombe	BUN.	Perfection	PFN.
Cleopatra	CLEO.	Prince Alfred	P.A.
Commerce	COM.	Ranelagh	RAN.
Cox's Orange Pippin	C.O.P.	Ribstone Pippin	RIB.
Crofton	CROF.	Reinnette de Canada	R/C.
Crow's Egg	C.E.	Rokewood	ROKE.
Delicious	DEL.	Rome Beauty	ROME.
Democrat (*see* also Tasma)	DEM.	Rymer	RYM.
Dougherty	DHTY.	Scarlet Nonpariel	S. NON.
Duke of Clarence	D.C.	Scarlet Pearmain	S.PM.
Dumelow (Wellington Pippin)	DML.	Senator	SEN.
Dunns	DUNNS.	Spitzenberg	SPTZ.
*Fameuse	FAM.	Statesman	STATE.
Fanny	FNY.	Stayman (Stayman Winesap)	STY.W.
Five Crown (*see* London Pippin)		Stewart's Seedling	S.S.
		Stone Pippin	STONE
Foster	FOS.	Strawberry Pippin (Winter Strawberry)	STR. P.
French Crab	F.C.	Sturmer Pippin	ST. P.
Granny Smith	G.S.	Tasman's Pride	TAS. P.
Gravenstein	GRAV.	Tasma (*see* also Democrat)	TASMA
Hoover	HOOV.	Thompson's Seedling	T.S.
Jonathan	JON.	Worcester Pearmain	W. PM.
King David	K.D.	Yates	YATES.
King of Pippins	K.P.		

*Known as Fanny in New South Wales.

Wrapping.

We hear of right-hand and left-hand wrappers. Either in the writer's opinion can be correct. A packer should always handle the fruit with the hand that he naturally uses. As an illustration, a man who naturally uses his right hand should handle the fruit with this hand and pick up the wrapping-paper with his left hand. Picking up the wrapping paper is only a mechanical operation and can soon be acquired using either hand. On the contrary, picking up fruit to pack is more than mechanical, as the element of instinct in picking up the correct size to pack enters into it. Good packers size correctly largely by this instinct of feel. This naturally should be more highly developed in the hand that it is natural to use, so that the greatest efficiency should be attained by natural right-handers picking up the fruit with the right hand. Packers should practice placing the fruit in the case with both hands. Common Sulphite wraps are glazed on one side. This side should be placed up in the paper-holder, so that when the fruit is wrapped the glazed or shining side is on the outside.

Method of Wrapping.

Place wraps in the paper-holder, glazed side up. A rubber finger stall may be worn on the forefinger of the left hand, as by its use single wraps are picked up easily. The wrap is picked up with the left hand, one corner pointing towards the packer, the centre of the wrap in the centre of the palm. At the same time an apple is picked up with the right hand.

The apple is thrown into the wrap with some force in order to jerk up the edges of the wrap around the apple. The apple strikes on its cheek in the centre of the wrap, with its stem end pointing midway between the thumb and index finger. As the apple is caught the thumb and fingers of the left hand are closed about the apple, forming a cup, and remain in this cupped position throughout the wrapping process. As the apple is thrown the right hand advances towards the blossom end of the fruit with fingers together and thumb extended at nearly right angles to fingers. The index finger is up and the little finger is down. The lower corners of the wrap are brushed closely over the apple with the thumb and forefinger of the right hand, bringing all corners of the wrap tightly together at the top, except the corner between the thumb and forefinger of the left hand.

Now, holding the apple tightly within the wrap with the thumb and forefinger of the right hand, both wrists are twisted towards the right. The apple turns within the cup formed by the left hand, the fingers of the left hand moving between the apple and the fingers of the right. The hands are turned completely over, until the back of the left is upward and the back of the right is downward.

The apple is now held in the cup formed by the left hand, with its stem pointing between the second and third fingers, and is placed in the box with the tails of the paper downward, while the right hand reaches for another apple. The positions illustrated are described in detail, but it must be understood that, when wrapping, these positions blend into each other so rapidly that an expert packer appears to be picking up apples with his right hand and paper with his left, and placing the wrapped apple in the box. It is readily seen that

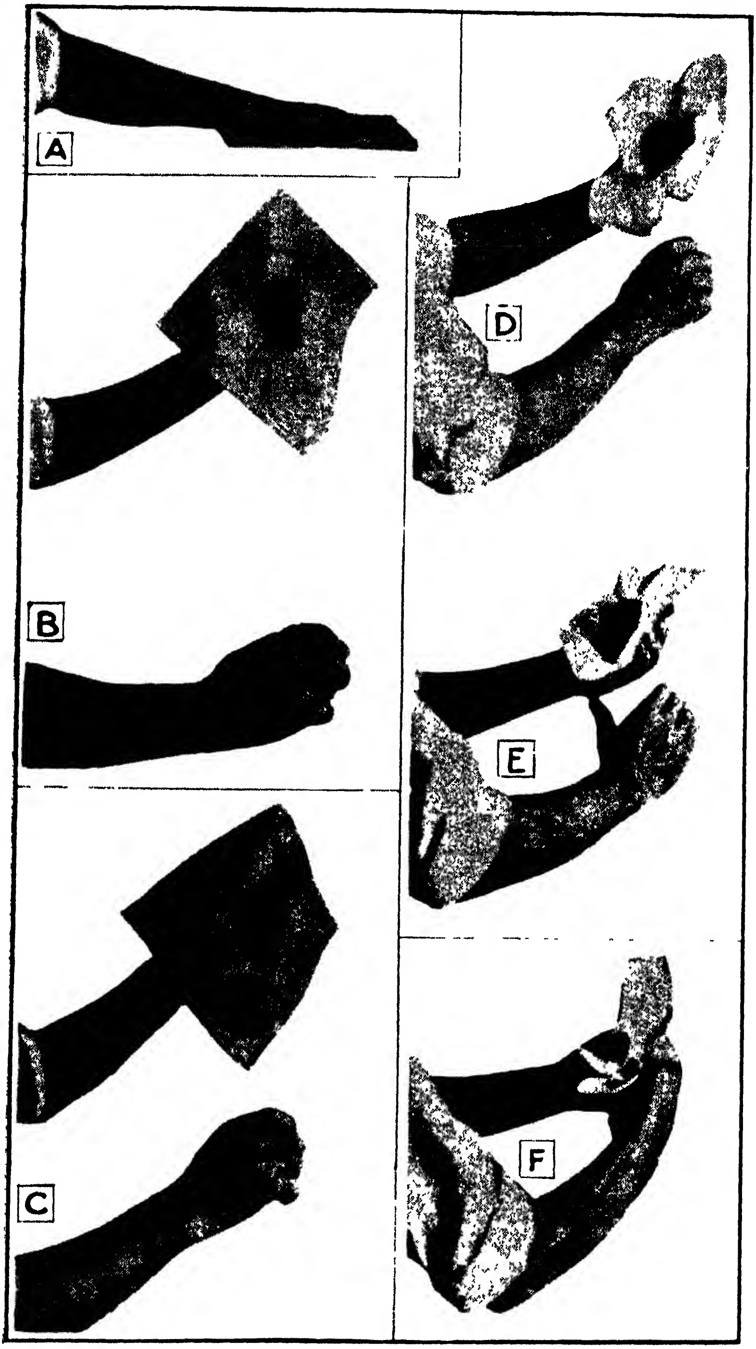


PLATE 33.—METHOD OF WRAPPING AN APPLE.

(A) Picking up the wrap; (B) Picking up the apple; (C) Throwing the apple into the wrap; (D) Position of apple when striking wrap; (E) Wrapping process, first stage; (F) Wrapping process, second stage.

if the wrap is picked up with the right hand and the apple with the left the motions would be reversed. Most apple packers use the general method described, although there are some variations in the details. Beginners should be warned against forming habits in the operations which result in lost motion, for such habits are difficult to overcome. Experienced packers will pack apples about as fast as they can pick them out of the bins. The average packer will pack from 100 to 125 boxes of machine-sized fruit in a day, but packers have been known to pack over 200 boxes in ten hours.

Packers on no account should use the grab pack, which is done by picking up a sheet of paper in one hand, then grabbing an apple with the sheet of paper still in the hand, giving the paper a rough twist with

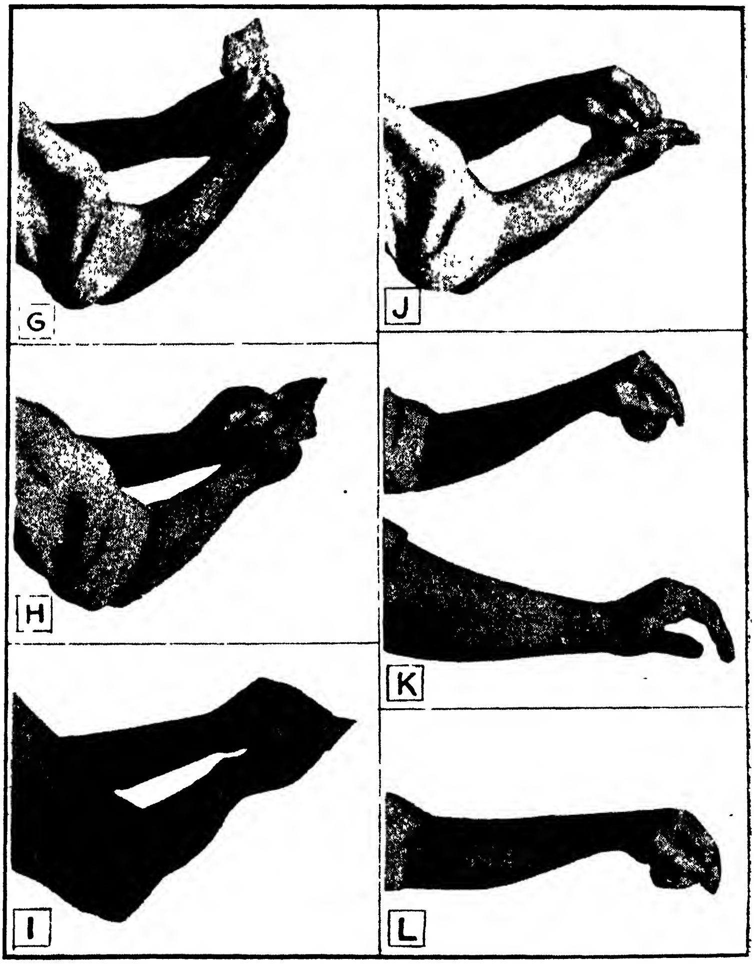


PLATE 34.—METHOD OF WRAPPING AN APPLE—*continued.*

(G) Apple held tighly in right hand, pressing apple against cup formed by left hand; (H) Apple turned within cup formed by left hand, both wrists turning toward right; (I) Hands turning over completely; (J) Back of left hand upward back of right hand downward; (K) Apple ready for placing in box, right hand reaching for next apple; (L) Placing wrapped apple in box.

the other hand, and placing it in the case. This pack usually leads to an untidy-looking packed case.

Wrapping has many advantages, some of which are—

(*a*) It prevents the spread of rots and mould in transit;

(*b*) Prevents individual fruit from being bruised;

(*c*) Gives a snug pack, making the keeping of the fruit in each layer easier, thus enabling packing to be done at a faster rate;

(*d*) Gives a better appearance to the finished package; and

(*e*) With fancy wraps has a better advertising value.

Wrappers.

Fancy wraps are another extra that usually amply repays the cost. Growers should remember that it is of little use using fancy wraps and coloured labels if the operations of grading and packing are not well carried out. Labels and wraps can be of immense value to good consignments, but they will also react the other way if the best is not put into the quality of the fruit, &c. Many growers who are not in the position to have fancy wraps printed, to get away from the ordinary methods use coloured wrappers. These are attractive and well worth while. It is essential that all consignments of fruit overseas be carefully wrapped. Oiled wraps to control scald are strongly recommended for Granny Smith and Jonathan. The following sizes of paper are recommended for use:—

2 in. to 2½ in. apples— 9 in. x 9 in. = approx. 2,880 sheets to 7 lb. ream.

2⅝ in. to 2⅞ in. apples—10 in. x 10 in. = approx. 2,300 sheets of 7 lb. ream.

3 in. and over—11 in. x 11 in. = special size.

(This size of apple is not suited for export.)

The packs shown for each shape have been thoroughly tried out in the Stanthorpe district over a four-year period and should present no difficulty.

Case "Get-up."

Having taken care in packing, growers should complete a good job by giving careful attention to the outside appearance of the finished case. A well-chosen fancy label is an attraction and an asset, being a cheap advertising medium, the average coloured label costing very little. Growers not marketing fruit in sufficient quantity to warrant an outlay on labels may still make their cases look attractive by neat stencilling. Where growers as individuals are not in the position to obtain labels, an economical means of obtaining the use of a label is for a number to join together and obtain a designed label with a common district brand design, only the grower's name and address (which could be added by rubber stamp) differing on each grower's label. This enables a quantity of labels to be procured, thus cheapening the cost. A label must have the grower's or packer's (i.e., packing house) name or brand and address, the address to include the word "Australia" in ½-inch letters. Spaces should also be left to include the variety, number or size of fruit, and grade standard; rubber stamps can be procured to insert these particulars after packing. It is recommended to brand on the label the count in preference to the size. Labels made 8½ by 11 inches in size will fit either the Standard or the Dump case end.

Label Paste.

Good flour paste is satisfactory for applying labels. The paste is applied to half a dozen case ends at a time. The labels, which are soaked in a can of water, are drained and given an application of paste on their backs, placed on the pasted ends, and gently rubbed with a damp rag. A satisfactory paste is made from flour as follows:—Take 1 lb. of flour, ½ oz. alum, and 1 pint water. Mix into a thick paste and then add boiling water until the paste thickens, stirring all the time. If too much boiling water is added, making the paste too thin, boil slowly, adding a little more flour. If to be used immediately the paste can be made without the alum, or by adding a small quantity of bluestone as a preservative can be kept for short periods. If bluestone is added, use only an enamel or glass paste container to prevent corrosion.

If using stencils only and marketing in Queensland, under the Fruit and Vegetables Act it is necessary for the packer to brand his initials, name and address, legibly and durably within a space measuring not less than 5 inches long by 2 inches wide. The name of the variety of fruit and the size or count must also be branded in letters of not less than half an inch in height. When sending overseas the word "Australia" must be included in the address.

Cases should be branded so that as little confusion as possible is caused to loaders and checkers during transit. A good system is to brand as follows:—

One End—Shipping or Agent's Number.

Examples:

409 LONDON	W.A. 12 BRIS.
(Export)	(Local)

Opposite End—Grower's name and address, Variety, Number, and Grade.

Example:

J. JONES, Stanthorpe, Queensland, AUSTRALIA. EXTRA FANCY. G.S. APPLES 125

(Export or Local Market)

Good branding should be neat, and should not show stencil ink smudges from running the brush over the edges of the stencil plate; make your stencils with a good margin around the lettering to prevent this.

Wire Strapping.

Wire strapping the packed case is always recommended. Wire strapping is an insurance against ullage and damage from bad handling. Some packers are not careful about this operation. The wires should be put on the cases neatly, running parallel with the edge of the end of the case. The wire should be placed around the box just off the inside edge of the end of the case. Wires placed too near the centre of

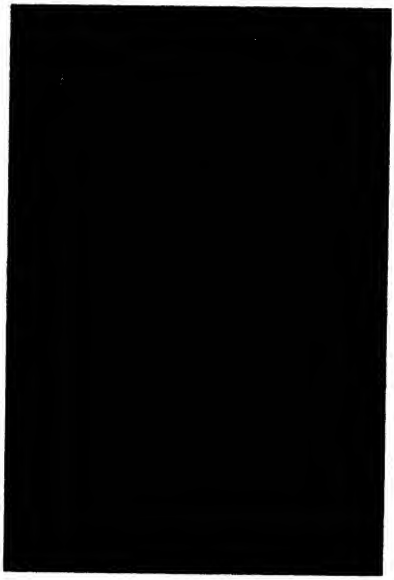


PLATE 35.—METHOD OF PLACING WIRES AROUND THE CASE. (Note bulge on fruit.)

the case are likely to pull the timber in too tightly and damage the fruit. When there is a bulge on the case they are not able to grip the timber of the box unless put on too tightly with the consequence as the fruit shrinks and the bulge gets smaller the wires become loose and are easily removed, thus defeating the object for which they were intended. When wiring, the machine should never be placed on the lid or bottom but on the side where there is no bulge.

Export Requirements.

Growers intending to export should make themselves familiar with the following:—Export Regulations embracing the requirements for Fruit, Cases, and Packing.

I have dealt with the requirements for harvesting, disease elimination, and quality. A copy of the Grade Standards may be procured from the Department of Commerce, 419 Collins street, Melbourne, C1. This should also embrace the casemaking requirements for case timbers, corrugated cardboard, and woodwool, branding, &c. It is necessary that all cases packed for export be lined, top, bottom, and sides, with woodwool or corrugated cardboard, which can be specially procured cut to size. The modern corrugated cardboard is recommended in preference to woodwool. Care must be taken to place the corrugations turned outwards away from the fruit, otherwise marking of the fruit will take place

A SUMMER SUIT
FOR
2 15 0
AN ALL-WOOL WORSTED OR FINE TWILL SERGE SUITING—THE BEST VALUE IN QUEENSLAND.
We are Mail Order Suit Specialists, and will send you the finest range of patterns on receipt of this coupon.
Mail this COUPON
Please send me Patterns, Tape Measure, Forms, etc.
Name............................
Address..........................
..............................A.J.
STUART SUIT SPECIALIST
181 ADELAIDE ST. BRISBANE
2 DOORS FROM FINNEY ISLES & OR. ALEXANDERS DEPÔT

during transit. An advantage corrugated boards have over woodwool is that the use of the boards cannot be abused in the same manner as woodwool through placing too much on the bottom and top of the fruit. Woodwool is often used with a thick layer placed on the top and bottom of the fruit to make up a deficiency of fruit through bad packing. Where practices of this nature are used the obvious result is shortage of weight in the fruit, which must of necessity cause dissatisfaction overseas. Buyers overseas expect a minimum weight of 40 lb. to the case when packed, a weight which is easily obtainable with good packing. Consignments for local market occasionally show this abuse of the correct use of woodwool, to the detriment of prices.

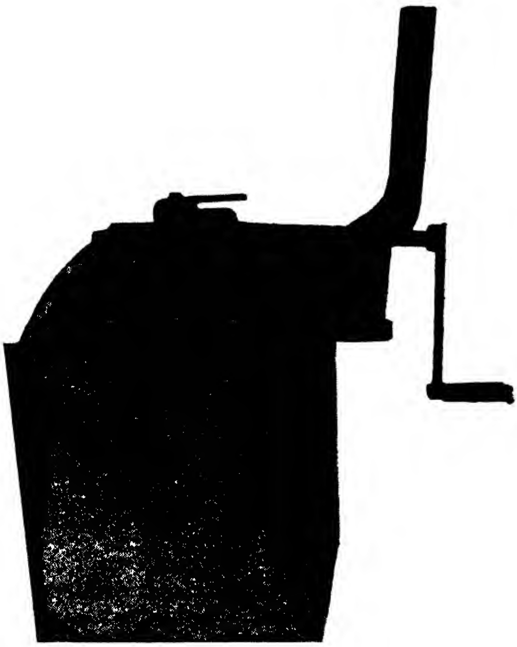


PLATE 36.—METHOD OF PLACING WIRING MACHINE.
(Observe the amount of overlap allowed the handle of the machine. This allows free movement whilst the wire is being tightened.)

Nailing Down.

Care must be taken when nailing down to place battens beneath each end of the case to allow the bottom boards to bulge when the pressure is applied to the fruit. A case-lidding press properly used is a fine implement for shed use. Where cleats are used for the Standard case they sometimes have a tendency to dry and split when nailed. This can be overcome by placing the cleats in a container of water a few minutes before nailing. Nails should be nailed through both cleat and timber of the lid of the box, the same nails being used to nail both.

Stacking in Trucks and Carts.

It is often noticed that growers and carters do not take care in carefully stacking packed cases in trucks and on carts. Cases should always be stacked on their sides where there is no bulge, the thicker timber giving added protection to the fruit. Carters or salesmen should

on no account use cases of packed fruit to sit on when driving along or selling. All of these faults have been noticed by the writer during his travels through orchards, railway-yards, packing-sheds, and markets.

Essential Points to Observe for Packing Successfully for Market and Storage.

1. Handle all fruit carefully during all operations.

2. Pick only matured fruit of good quality and count for the variety.

3. Remove all rejects as far as possible in the orchard and on the sorting conveyor before the sizing operation takes place.

4. Eliminate the marketing of all unprofitable unpopular varieties.

5. Always do standard packs and counts that are known to the buyers.

6. Keep all machinery and buildings thoroughly cleaned up of waste and fly-stung fruit. Spray working parts with a 5 per cent. solution of water and formalin periodically.

7. See that all nails, splinters, screw heads, or other projections on cases, sizing machines, &c., are removed.

8. Make sure that all corners and sides of sizing bins are padded.

9. Have sizing machines running at the correct speed for the particular type of apple, flat or deep, that is to be sized.

10. Wrap all consignments where possible and always when they have to travel any distance.

11. Place corrugated boards on top, bottom, and sides of cases.

12. Take every care when handling and stacking packed cases.

Storage.

Storage may be divided into two classes, common storage and cold storage. The Stanthorpe district's cold dry-aired winter climate permits of some varieties giving fair results with common storage. Granny Smith, Dunn's, and Stewart's Seedling are the varieties that can be handled under these conditions. This type of storage becomes risky and wasteful after eight weeks and is not commercially advisable. Only small lots should be kept and care should be taken to see that the boxes have a free circulation of air all around, the bottom boxes being stacked on battens to permit this. Green varieties stored in this way turn to a yellow colour which is not popular with buyers. The fruit also becomes greasy and if care is not taken light dust from the air will adhere to it, spoiling the general appearance for marketing. Before stacking fruit for storage all floors and walls whereon or whereby the fruit is stacked should be sprayed with a 5 per cent. solution of Formalin to destroy any traces of rots or fungi that may have accumulated from damaged or waste fruit running over the floors, &c.

Commercial Cold Storage.

Cold storage consists of two systems, air circulation or direct expansion. Both systems have points to recommend them. It is considered by many that the direct expansion system does not cause the same amount of shrinkage in the fruit as the air circulation. This

remains to be proved. The main essential for successful storage is harvesting the fruit at the correct time. All apples must be fully matured for successful storage, although care must be taken to see they are not overmatured. Overmatured fruit has only a short storage life before internal breakdown takes place. Immature fruit is more prone to develop Bitter Pit and Apple Scald. Stanthorpe apples appear to have only a medium cold storage life, and it is recommended that only hard varieties such as Granny Smith and Dunn's be stored. Whilst many varieties will store for different periods, it must be remembered by the grower that it is unprofitable to store any variety that shows waste on removal from the cold chambers. Consideration must also be given to the fact that it is not only necessary to store fruit for a period, but the fruit must be capable of keeping in good condition after removal from storage long enough for distribution and consumption. Inspection of stored apples has shown that immaturity is the greatest fault. Seasonal variations prevent any definite dates for harvesting being fixed. It would appear that cold-storing Granny Smiths picked before the fourth week and Dunn's before the second week in March gives a risk of the fruit being immature. Jonathans from the Granite Belt, it would appear, have only a short storage life, developing waste in storage after June to an extent that makes them unprofitable. Delicious have a slightly longer storage life. Where storage is carried out I would recommend the following system of inspection to be rigidly adhered to —April and May, twenty-one-day inspections; June-July, fourteen-day inspections; August-September, weekly inspections. Storage after September begins to show a much higher percentage of waste. In the Southern States the most satisfactory system of storage is by a chain of local co-operative stores where the fruit is placed unwrapped into storage in cases and packed out for market as required. As this system of co-operative local cold stores does not prevail in Queensland, growers of necessity pack their fruit before storing so that greatest advantage can be taken of the space paid for. This system has the disadvantage of making it hard to eliminate the waste, especially when only, as in successful storage, a small percentage of waste develops. Buyers take advantage of this waste, if not removed, to offer lower prices. It is advisable, to control Scald, to use oil wraps, particularly for Granny Smiths. A storage experiment conducted over a period of a whole harvesting season showed the following results in Scald control:—

Sulphite Paper Wraps	29·8 per cent. affected
Unwrapped	21·5 per cent. affected
Oiled Wraps	13·5 per cent. affected

Fruit sprayed with White Oil one week before storage developed very little Scald.

Sweating.

	Per cent. affected.
Unsweated	31·8
Sweated fourteen days	14·6
Sweated twenty-eight days	10·5

Weather conditions had an effect on the harvesting period experiments, which did not give any definite indication of procedure, but as previously mentioned in the control of Bitter Pit it is absolutely imperative that fruit be matured before storing. The experiment has showed that

wrapping fruit for transit and storage assists in eliminating case bruising. Where fruit is stored unwrapped the addition of oiled shredded paper placed amongst the fruit will give a measure of scald control.

The main essentials of successful storage are as follows:—

(1) Select only sound fruit with unbroken skins and stalks intact.
(2) Store only fully matured apples.
(3) Handle carefully during all operations.
(4) Use oiled wraps on all varieties of apples susceptible to storage scald.
(5) See that inspections are made periodically.
(6) Remove fruit from storage, and market if signs of storage troubles develop.
(7) Do not attempt to store fruit for too long a period.

In conclusion, some notes on marketing will possibly not be amiss. The keynote of successful marketing is sending regular consignments of graded fruit to the same centre. Buyers soon learn to ask for graded lines of fruit, hence the reason for regular weekly consignments to enable one's brand to always be procurable. Careful grading of first and second quality fruit is necessary to keep and secure goodwill. Consignments of mixed first and second quality are always paid for on the basis of the lowest quality in the case, a basis that usually is unsatisfactory to all parties—grower, agent, and consumer. The consumer is the one to be satisfied. Satisfaction to the consumer should ensure satisfaction to the grower and agent per medium of better prices. A sufficiently supplied market of good fruit will always return better and more profitable prices than an over-supplied market glutted possibly through the small percentage of poor quality fruit. To secure satisfactory and profitable conditions for all, it is necessary that all strive to give the maximum of quality coupled with the maximum of efficiency in get-up and handling. It is only by doing this that the apple industry will prosper and become one of the great assets to the country that are necessary for us to hold our rightful place amongst the leading countries of the world.

(TO BE CONTINUED.)

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Packing-house Management.

By J. H. GREGORY, Instructor in Fruit Packing.*

THIS is a subject that to many growers of fruit appears to be of little importance. Generally speaking, the importance of clean packing-houses is not as fully appreciated as it might be. It is not generally realised by agents handling fruit that a lot of the rots or fungi affecting fruit whilst stored in the market sections could be greatly minimised if more care was taken on the section. As in the packing shed, so in the market section, much fruit is affected by coming in contact with the spores from what has been left behind of decayed fruit impregnating the floors, &c., of the section. This infection of the fruit generally takes place through portions of fruit that have been damaged during handling whilst in transit to the markets.

Retail storerooms also could be treated with advantage to the buyer. Our first consideration in the operation of a good packing shed should be the layout and equipment. This can be done in such a manner as will enable the methods advised in the following remarks to be carried out with a minimum of time and labour.

The most economical and time-saving way of laying out a packing shed is in such a way that the work will progress from one side to the other without hindrance. This is achieved by receiving the fruit at one side of the building, placing it on the sizing machine or grading table, packing it, and delivering it to the wagons at the other side. Growers with small sheds can use a modification of this system. It must be always borne in mind that it is impossible to efficiently conduct or keep hygienically clean any packing shed, private or otherwise, unless a systematic method of working is adopted. It should be easily understandable that inefficiency and slowness of handling must materially increase the amount of breakdown and waste in fruit, with a higher risk of infection to following consignments.

Machinery is now becoming more generally used throughout the fruit industry. Sizers, washing and drying machines are increasing in number every week. Machinery of any description should be so placed in the shed that it is easy to attend and keep clean. Care must be taken to have all things, such as nails, splinters, sharp corners, &c., effectively padded, smoothed off, or covered to eliminate all chances of damage to fruit. The same should be done with orchard boxes and picking utensils. A periodical treatment of these utensils will greatly assist in eliminating the risks of decay during transit, as the source of infection is greatly reduced. A 1 in 20 solution of formalin and water is quite an effective spray for the machinery, walls, and floors of packing-houses. Walls can be sprayed at lengthy intervals, floors monthly, and sizing machines and brushers weekly. Remember, prevention is better than cure!

While this talk has a general application to all packing sheds, growers of various kinds of fruits will find different difficulties to contend with in their packing sheds and storerooms.

With citrus fruits we find that the most common storage and transport development is the so-called blue mould. This common name is

* In a radio address from Stations 4QG (Brisbane) and 4RK (Rockhampton).

not altogether correct, as actually there are two distinct moulds that appear under the common name. They are, giving the common names, blue contact mould and common green. They differ in the following characteristics:—

Blue Contact Mould.—Blue forming on the surface and also inside the fruit. Wrapping paper not readily adhering to the fruit.

Green Mould.—Olive green forming on surface only. Wrapper adheres closely to the rotting fruit. This is the most prevalent of the two moulds.

As the green mould depends mostly on skin injuries for its means of infecting fruit, it can readily be seen how necessary it is to eliminate all sources of skin injury, such as nails, screws, splinters on sizing machines, &c.

Blue contact mould, as the name suggests, will spread by infected fruit coming into contact with other fruit. From this will readily be seen the need for destroying all infected fruit as soon as possible. How often do we see cases of waste citrus fruits left in odd corners of the packing sheds? Where fruit is sweated for periods and odd specimens become infected, care should be taken to keep these specimens from going on to sizing machines, as they will leave spores on the machinery to infect other fruit as it travels through the machine. It is not my intention to deal at length with all the storage and transit rots which careful methods of handling should practically eliminate. Spraying the machine with a 1 in 20 solution of formalin weekly, coupled with the periodical shed treatment as previously mentioned, is recommended. Orchard picking boxes, if used, should be dipped occasionally in a 1 to 100 solution of lime sulphur.

Tomatoes.

Irish blight, as it develops to a large extent in the field, is one of the worst troubles we have to contend with. Keep the sheds and plantations clear of all infected fruit, which should be carefully destroyed. Use separate picking containers to gather infected specimens. Do not use second-hand cases. Spray packing and sorting tables weekly.

Stone Fruits.

Brown rot is by far the worst trouble encountered whilst handling any fruit, its effect being so rapid. I have seen apparently sound fruit packed, and three hours after the fruit was unsaleable. Coupled with adequate field measures, the same control as used for Irish blight should prove effective. It must be remembered that the use of second-hand cases plays a large part in transmitting these diseases from one place to another. Where picking boxes are used, a periodical dipping in a 1 to 100 solution of lime sulphur is of great assistance. Care must be taken during handling to eliminate skin injuries, as these are often the first source of infection. Other transit rots are also caused by bruising and bad handling.

Apples and Pears.

Rots of the more virulent type do not trouble these fruits to the same extent as citrus and stone fruits. Careful handling all the time to avoid skin damage is giving very successful results. Where fruit is stored in the shed for a period of weeks, the walls and floors should be first treated with formalin. Skin damage is the usual cause of decay

starting in these fruits. It is usual for the bottom cases of stacked fruit to show a higher percentage of waste, due possibly to neglecting to treat the floors before stacking.

Packing sheds are also the means frequently of increasing the infection of an orchard by codling moth. Care should be taken to thoroughly examine all buildings and equipment for this pest, which uses cracks and corners in which to over-winter. Treatment with hot water will be of assistance. All orchard cases can easily be dipped in a tub of hot water at the end of the season.

While there are many more diseases one could mention, it will be found that the treatments recommended for the most general troubles will, as a rule, prove satisfactory in controlling our other transit and storage rots.

NOTICE TO SUBSCRIBERS.
SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

Dairy Fodder Plots.

By A. E. GIBSON, Director of Agriculture, and C. S. CLYDESDALE, Senior Instructor in Agriculture.

The subjoined notes are reprinted in response to numerous requests from readers in several districts in the State. They are of particular interest and value at the present time.—ED.

THE majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimbah Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the summer months

No fertilizers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

PLATE 37.—PRINCE WHEAT AND VETCHES AT MR. A. HULSE'S FARM, YANDINA.

PLATE 38.—PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.

At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and later on, in March, was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

The plot at Nindooimbah was fallowed during the summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.

The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disked" in, the cereals being sown on the disked surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early-maturing varieties.

Description and Varieties on North Coast.

The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 feet in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 feet at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 feet high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 feet in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 feet in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 feet 6 inches in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 feet in height.

Plots at Nindooimbah.

Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

[The varieties of wheat mentioned in the foregoing (Prince and Patriot) are now somewhat difficult, if not impossible, to obtain, but Warren and Warchief—two well-known wheats at present in use throughout the wheat-growing areas of Queensland—may with confidence be recommended as substitutes.

Similarly, Sunrise oats may be substituted for Ruakura, a variety of oats not always readily obtainable.]

Skinless and Cape Barley.

During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

Ruakura and Algerian Oats.

The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust

Rye.

Owing to its early-maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 feet in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.

Barley was sown at the rate of 50 lb. per acre.

Oats were sown at the rate of 40 lb. per acre.

Rye was sown at the rate of 60 lb. per acre.

Field peas were sown at the rate of 30 lb. per acre.

Vetches were sown at the rate of 20 lb. per acre.

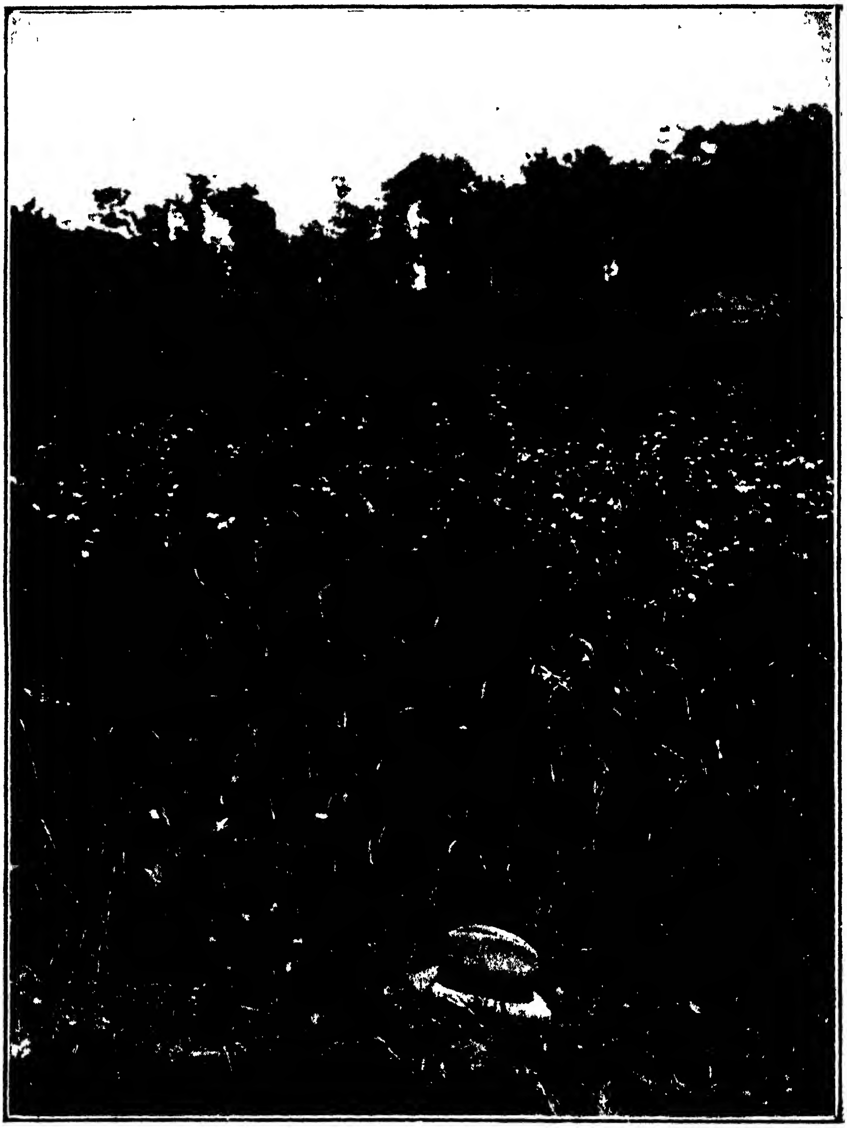


PLATE 39.—PATRIOT WHEAT AND FIELD PEAS AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

PLATE 40.—KUDZU VINE (FODDER PLANT) ON A FARM NEAR BRISBANE.

RESULTS.

Varieties.	Yields per Acre of Green Fodder.		
	A. Hulse, Yandina.	F. G. Burton, Bridges.	J. B. Stephens, Nindooimbah.
	T. C. Q. LB.	T. C. Q. LB.	T. C. Q. LB.
Prince wheat and peas	16 16 2 12	2 14 0 2	13 10 0 10
Prince wheat and vetches	10 16 0 8	6 1 2 4	11 17 2 20
Patriot wheat and peas	16 4 0 12	9 2 0 0	14 0 3 16
Patriot wheat and vetches	11 6 3 4	2 0 2 1	12 18 1 26
Rye and peas	10 16 0 8	5 5 1 9	14 11 2 22
Rye and vetches	7 11 1 0	Destroyed by wallabies	16 4 0 22
Cape barley and peas	12 3 0 9	10 16 0 8	13 10 0 10 (two cuttings)
Cape barley and vetches	7 11 1 0	2 19 1 19	15 2 2 0
Skinless barley and peas	11 6 3 14	Destroyed by wallabies	5 18 3 10
Skinless barley and vetches	5 13 1 21	Destroyed by wallabies	5 2 2 15
Ruakura oats and peas	9 9 0 7	4 3 2 25	18 18 0 14
Ruakura oats and vetches	7 11 1 0	Destroyed by wallabies	17 16 2 2
Algerian oats and peas	8 18 1 1	3 6 0 19	9 3 2 18
Algerian oats and vetches..	6 15 0 5	Destroyed by wallabies	9 14 1 24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

PLOTS AT TOOGOOLAWAH.

For some years the Department of Agriculture has endeavoured to interest dairymen and stockowners generally in the matter of fodder provision for their herds during those periods when, by reason of the lack of succulence in the natural pastures, yields from their herds have been considerably lessened, and, in some cases, even reduced within measurable distance of vanishing point.

The practice of arranging with interested farmers to carry out trials designed and supervised by officers of the Department, has met with a good deal of success. The results to date have clearly shown that by early and careful preparation heavy returns are readily available of rich, succulent, milk-producing fodders, and that a continuity of this class of food can in normal seasons be kept up to tide milch cows over periods during which their productivity is affected by the gradual depression, induced in each animal's system, by being called upon to make use of rough grasses of low nutritive value, at a time when weather conditions were at their worst.

Ocular evidence has shown that improved milk supplies and a correspondingly improved return from the factory is inducement enough for other neighbouring farmers to profit by the example of the one who first adopted the system of growing crops regularly, for his dairy stock —actually, on a farm, an inexpensive method of maintaining an income.

In the present crop trials carried out on Mr. T. Coleman's property at Toogoolawah, no fertilizers of any kind were used. The plots were situated on well-prepared alluvial soil near Cressbrook Creek, which had been under cultivation for a number of years.

The plots were sown on 31st March, 1925, and were harvested for yield-computing purposes on 30th July, 1925; consequently, each yield submitted represents four months' growth of fodder, and judged on this basis may be considered as highly satisfactory.

A more vigorous growth was noticeable in the case of Florence wheat and peas or tares and the Skinless barley with a similar mixture, both of which were well out in ear and rapidly maturing; rye had made a dense growth in both instances, but only a few heads were to be seen, and probably a further three or four weeks would be required to bring it to a similar state of maturity to that obtained by the Florence wheat at date of harvesting. The following yields were recorded:—

	Per acre. Tons.	cwt.	qr.	lb.
Florence wheat and peas	7	14	1	4
Cape barley and peas	9	11	1	0
Skinless barley and peas	10	15	1	0
Rye and peas	8	10	1	12
Algerian oats and peas	8	3	3	20
Canary seed and peas	11	8	0	24
Florence wheat and tares	7	4	2	16
Cape barley and tares	9	0	0	0
Skinless barley and tares	11	1	3	4
Rye and tares	12	13	3	20
Algerian oats and tares	10	15	1	12
Canary seed and tares	8	10	1	12

PLATE 41.

FLORENCE WHEAT AND TARES. Yield—7 tons 4 cwt. 2 qr. 16 lb. per acre.

In view of the fact that some of the plots might be regarded as too immature for the purpose of obtaining the maximum yield, further

weighings for comparative purposes were made on the 24th August, with the following results:—

	Per acre. Tons.	cwt.	qr.	lb.
Algerian oats and peas	11	9	3	12
Rye and peas	8	13	2	8
Canary seed and peas	7	17	2	0
Algerian oats and tares	13	19	2	6
Rye and tares	9	9	2	16
Canary seed and tares	13	14	3	8

When selecting fodders for the test, cognisance was taken of their respective periods of maturity so that a continuity in the supply of green fodder might be kept up. Obviously the grower, by using judgment in the matter of arranging for succession sowings, should readily be able to maintain his supplies, and in this way ensure a more regular state of productivity in his herd.

PLATE 42.
FLORENCE WHEAT AND DUN FIELD PEAS. Yield—7 tons 14 cwt. 1 qr. 4 lb. per acre.

Observations made respecting the period of development of the different crops were as follows:—Florence wheat and Dun field peas were ready for use earlier than any other single crop or combination, followed by crops in the order named: Florence wheat and tares, Skinless barley and peas, Cape barley and peas, Skinless barley and tares, Cape barley and tares, Rye and peas, Rye and tares, Algerian oats and peas, Algerian barley and tares, Canary seed and peas, Canary seed and tares.

Observations made indicate that it is advisable when arranging for mixtures of crops to confine the sowing of peas to the early-maturing cereals—Florence wheat, Skinless and Cape barley—as the peas begin to lose weight as they approach maturity. Tares, on the other hand, have a longer growing period and retain their succulence better than the field peas; consequently, they are more suitable for use with Algerian oats, Canary seed, and Rye.

To those dairymen who are interested in maintaining supplies to their respective factories throughout the winter period, the following quantities are recommended for use in connection with the above class of fodders:—

Wheat 30 lb., Dun field peas or Black Tares 20 lb.
Barley 40 lb., Dun field peas or Black Tares 20 lb.
Rye 30 lb., Dun field peas or Black Tares 20 lb.
Oats 30 lb., Dun field peas or Black Tares 20 lb.
Canary seed 10 lb., Dun field peas or Black Tares 20 lb.

PLATE 43.
CAPE BARLEY (in short blade stage) AND DUN FIELD PEAS.
Yield—9 tons 11 cwt. 1 qr. per acre.

DRY SEASONS—A COUNTERING FIELD CAMPAIGN.

The loss of national wealth to this State brought about by periods of drought cannot be accurately estimated by figures—but their effects

PLATE 44.—PEAS AND PILOT WHEAT ON MR. F. W. THIEDEKE'S FARM AT BEAUDESERT.
Weight 10 tons 17 cwt. 2 qr. 19 lb. per acre.

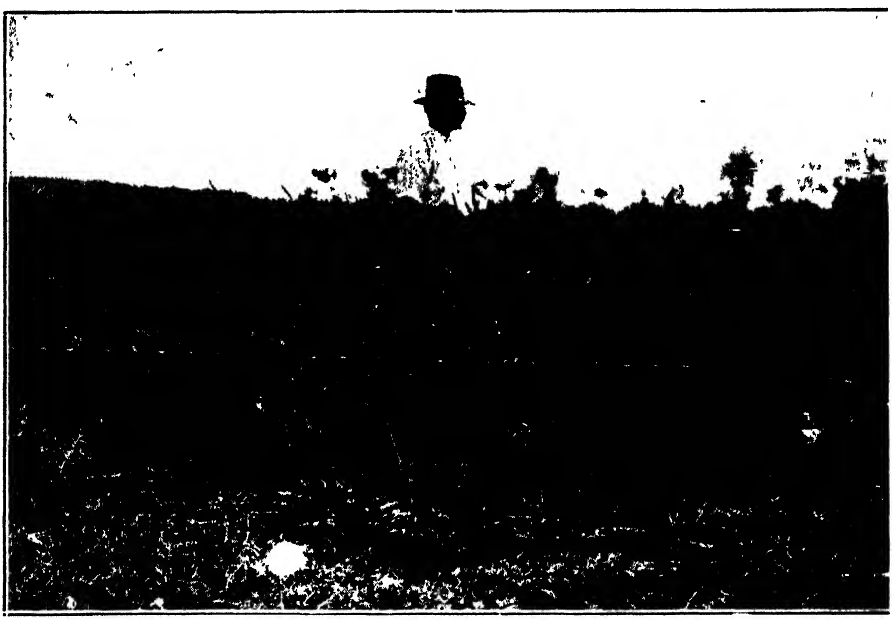


PLATE 45.—PEAS AND FLORIDA WHEAT ON MR. F. W. THIEDEKE'S FARM AT BEAUDESERT.
Weight—11 tons 17 cwt. 2 qr. 20 lb. per acre.

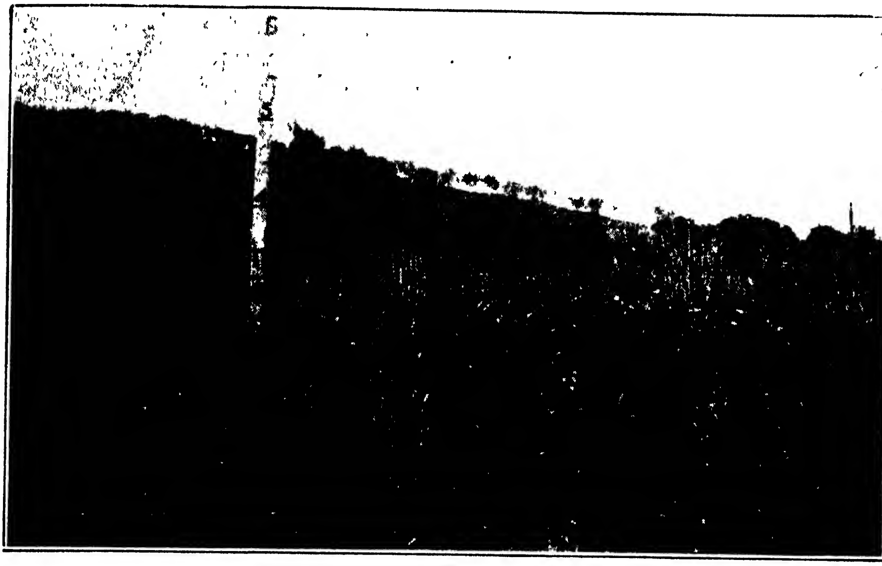


PLATE 46.—PILOT WHEAT AND PEAS AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

are undoubtedly far-reaching. If action can be taken over certain areas whereby increased production can be brought about, it naturally follows that dry periods are robbed to some extent of their devastating influences and the loss to the State as a whole is decreased. A policy of this kind is naturally educative in its character to all, but when certain sections are dealt with it becomes more particularly of value to those directly interested, and this is increased when illustrations are given for the purpose of proving the policy advocated.

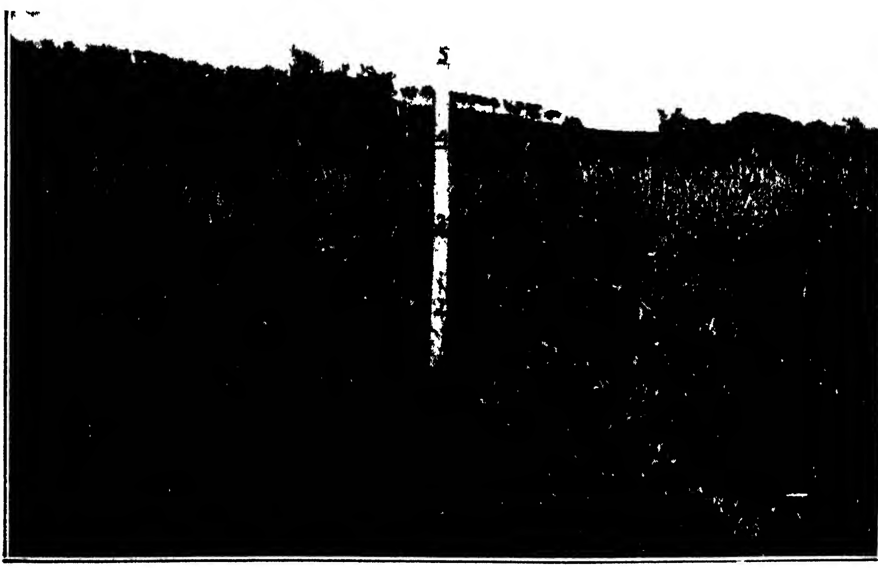


PLATE 47.—FLORIDA WHEAT AND VETCHES AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

For some time past the Department of Agriculture and Stock has interested itself in increased production of dairy and allied products, and with this object in view has initiated a series of fodder trials in various districts for the purpose of pointing out that if means are adopted for the annual provision of fodder crops for dairy stock and pig raising, the fluctuations which have in the past taken place in the supply of these products will be considerably reduced if not entirely removed.

During the past few months the losses to dairymen and others, brought about by lessened production resultant of the dry period experienced, amounts to a considerable value, and attention is drawn to the fact that these can be considerably reduced by adopting the policy of careful soil preparation and the sowing of crops calculated to fill the void caused by the absence or decreased supplies of natural grasses and herbage.

It was with such an object that dairy and pig fodder trials were established on the farms of Messrs. F. W. Thiedeke and Peel Caswell, of Beaudesert and Wangalpong respectively, and results obtained so far from portions of these plots have proved the soundness of the principle involved. Both farmers are capable agriculturists, whose methods of cultivation leave little to be desired, and who are fully seized of the importance of fallowing and thoroughly preparing their land prior to seeding operations. The results obtained on the comparatively low rainfall experienced at Wangalpong speak for themselves; and whilst the soil at Beaudesert is of a heavier nature than that met with in parts of the Canungra Valley, the heavier rainfall experienced more than compensated for the difference in soils and their moisture-retaining qualities.

The plots were planted on the 9th and 10th June at Mr. Thiedeke's at Beaudesert whilst those at Mr. Caswell's at Wangalpong, were planted on the 12th and 14th of June, rainfall experienced between the 9th June and 23rd September (the date of harvesting) at Mr. Thiedeke's being 3·66 inches, but it must be noted that a fall of 1·06 inches was experienced on 7th June, two days prior to planting. At Mr. Caswell's the rainfall received between the 12th June and 24th September totalled ·91, the previous rains to that date being 1·25 inches, registered on 14th and 17th May.

The following weights of green fodder were recorded:—

	Mr. F. W. Thiedeke, Beaudesert.				Mr. P. Caswell, Wangalpong.			
	Tons.	cwt.	qr.	lb.	Tons	cwt.	qr.	lb.
Florida wheat and peas ..	11	17	2	20	7	6	1	22
Florida wheat and tares .	10	8	3	13	7	4	0	5
Pilot wheat and peas ..	10	13	2	19	8	5	2	17
Pilot wheat and tares ..	10	4	0	7	6	12	0	5
Skinless barley and peas ..	11	8	0	8	6	4	3	10
Skinless barley and tares ..	4	16	0	3	7	1	2	16
Cape barley and peas ..	6	2	1	21	4	18	1	20
Cape barley and tares ..	9	7	1	1	4	16	0	3
Rye and peas	5	15	0	27	4	16	1	20
Rye and tares	8	0	3	11	3	7	0	25

The varieties of wheats used in the trials were Pilot, a Bunge-Florence crossbred, and Florida, a Bobs-Florence crossbred, both of which were raised at Roma State Farm. These varieties made excellent

growth, and were remarkably even throughout the trials. At the time of harvesting both varieties were in the flowering stage, averaging 3 feet 6 inches in height.

At Wangalpong both Pilot and Florida showed signs of flag-rust, but at Beaudesert no signs of rust were apparent. This was probably due to local conditions and to the fact that humidity in the Canungra Valley is greater than in the more open areas around Beaudesert.

Cape Barley.—This crop made fair growth and when harvested was in the shot-blade stage—the height averaging 1 foot 9 inches of good healthy growth. From the general appearance of the crop a later cutting will give a heavier yield.

Skinless Barley was a clean and attractive crop, averaging 3 feet in height, which had made a remarkable growth of foliage. When harvested the grain was in the soft dough stage.

Rye.—In each case this crop made rapid growth, and was in the flowering stage when harvested, averaging 3 feet in height. Generally speaking, growth was somewhat on the thin side, and heavier quantities of this cereal should be sown when the season is somewhat advanced, as it was in this particular instance.

Field Peas in all plots made fair average growth of 1 foot 6 inches in height. When harvested they showed signs of wilting, thus reducing the weight per acre that under other conditions would have been recorded.

Vetches, usually rather slow in maturing when compared with peas, made favourable growth.

The pig fodder plots were not sufficiently far advanced in growth on 23rd September to justify their harvesting; consequently, this matter was deferred till 24th November, but during this period a further rainfall of 326 points was received and recorded as follows:—25th September, 32 points; 28th September, 166 points; 16th October, 46 points; 25th October, 9 points; 16th November, 73 points; total, 326 points.

As a result increased growth was in evidence compared with that shown on the occasion of the previous visit.

As in the case with the dairy plots, Mr. Caswell had given careful attention to the cultivation of the various fodders, and an entire absence of weed growths was noticeable.

The various yields recorded can be regarded as valuable illustrations of what can be accomplished by careful and systematic cultivation of crops that are suited for purposes of economic pig-feeding and can be produced at little cost to the grower.

The following are the yields recorded:—

	Per acre. Tons.	cwt.	qr.	lb.
Thousand Headed kale	11	15	3	3
Dwarf Essex rape	6	9	2	16
Yellow Glode mangles	29	8	1	20
Long Red mangles	23	19	2	12
Purple Top Swede turnips	14	18	0	27
Elephant Swede turnips	12	13	3	18
Sugar beet	17	6	2	12
White Belgian carrots	12	13	3	18

The Dwarf Essex rape suffered somewhat from the attacks of Aphis, whilst the foliage of the Swede turnip was subjected to the attentions of the Rutherglen Bug; otherwise the crops were excellent in every respect.

Economic Geography of Sugar.

By C. V. HIVES, B.A.

The following is the full text of an address delivered by Mr. C. V. Hives, of "The Australian Sugar Journal," under the auspices of the Educational Broadcasting Committee of Queensland, being one of a series of lectures on the Geography of some Important Primary Products; and broadcast from Stations 4QG (Brisbane) and 4RK (Rockhampton).

THE two chief sources of raw sugar are the sugar-cane and the sugar-beet. The world produces some 25 million tons of sugar per annum, two-thirds of which is derived from sugar-cane and one-third from sugar-beet. The refined sugar of commerce made from either of these two sources is precisely the same commodity, though it is marketed in various forms, such as lump sugar, granulated, and so forth. The sugar-cane has been known since time immemorial, and to-day is cultivated within a climatic range covering both tropical and sub-tropical regions. Botanically it is a gigantic grass resembling a bamboo and well known to most Queenslanders. The sugar-beet is a sweet root of the same species as the ordinary garden beet-root, but it is white, not red. It is grown for sugar production in most European countries, including Russia, and in parts of the United States of America. A glance at the map of the world will show that the 50th parallel of latitude in the northern hemisphere runs through the beet belt in both Europe and North America.

Sugar, in one form or the other, is now being produced in at least sixty different countries. An exhaustive study of the subject would entail a survey of mankind, literally, from China to Peru. The mere geography, including climatic factors, is comparatively a simple matter to explain. The important factors which have determined the present distribution of sugar production throughout the world are political, historic, and economic. In the production of sugar national policies have always played a particularly important part, more important than in the case of any other primary product. This is a fact that must always be borne in mind in any study of sugar as a world commodity.

A convenient way of approaching the subject, perhaps, is to outline the rivalry that has prevailed for the last century and more, and is still prominent to-day, between cane-sugar and beet-sugar. Here we have the interesting feature of direct competition between the agricultural production of tropical and temperate zones. The commercial commodity itself is identical, but produced from two very dissimilar plants growing respectively under two very different sets of geographical conditions. Cane-sugar might be described, not inaccurately, as crystallised sunlight, and the tropical zone with its hot, moist weather is the natural home for its production. In the case of beet, the bright light of direct sunlight is not necessary for sugar formation, the diffused light from a cloudy sky being found to be suitable. This has been demonstrated in recent years by experience in Great Britain. This double origin of sugar—from the tropical and temperate zones—means that the area of supply is very widely distributed. Fluctuations of world production due to climatic factors alone are therefore relatively small.

The potential and actual yield of sugar from cane is considerably higher than from beet. Beet-sugar, however, has always owed both its development and its maintenance to tariffs and subsidies which have enabled it to withstand the competition of the tropical product. It is true that in recent years cane-sugar has also been fostered in some countries, so much so that probably three-quarters of the world's total output of sugar to-day receives some form of protection or preference. There is little doubt that were all forms of production to be withdrawn, the production of beet-sugar would shrink to very small dimensions and in many countries would disappear altogether. Sugar-beet, however, is an important rotation crop, and its position in European agriculture is further strengthened by the value of its by-products in the feeding of livestock.

Historical Review.

The establishment of the beet-sugar industry was really due to Napoleon. As part of his campaign against England, he declared an embargo against any merchandise entering the Continent from England or her colonies. America and the West Indies were then the chief sources of sugar, and Napoleon thus cut off supplies from Europe. He then set aside large tracts of land for beet-raising and compelled the peasant farmers to cultivate beets. Great difficulty, however, was experienced in the first attempts to manufacture sugar from this new source. It was only the power exercised by Napoleon and his determination to outdo the English that brought this new industry into existence. In the end Great Britain reigned supreme at sea, and on the downfall of Napoleon in 1815 the ports of Europe were thrown open to cheap cane-sugar from the Colonies. The newly-established beet industry which had spread over Germany, France, and Austria, was unable to hold its own, but the various Governments concerned came to the rescue and fostered it in every possible way. Then the cane-sugar industry suffered a severe setback owing to the abolition of slavery in most of the European colonies. Twenty or thirty years elapsed before the planters became accustomed to the new state of affairs. This transition period coincided with the artificial extension of the beet industry, which was encouraged and supported by bounties and privileges of all kinds. The production of cane-sugar remained almost stationary, but the beet-sugar industry in Europe gradually increased so that at the end of the last century it accounted for nearly two-thirds of the world's total sugar supply.

Sugar, and its chief by-product, rum, played an important part in the early history of the last century. "In their tropical climate," says one writer, "the West Indian planters had learn to distil from the sugar-cane the most warming and comforting spirit for a damp and capricious climate that Nature could devise." Rum, for more than two centuries, has been a naval ration, the allowance to an ordinary seaman at one time being half a pint a day. Nelson's body was brought home from Trafalgar preserved in the only cask of rum left on board the "Victory." The battered remnant of the crew were obliged to "broach the Admiral" on the way home to save their own lives. "Draw on, my heartiest!" says the shade of Nelson in "The Dynasts," "better I shrivel than you famish!" Rum, in fact, according to another writer, was a foundation of British sea-power. At any rate, British sea-power at that time undoubtedly determined to a large extent the future trend of sugar production throughout the world at large. The history of sugar and its chief by-product is a picturesque one. Rum was the

currency of the slave-trade, which in turn was the backbone of the sugar industry. It was also the currency of the Colony of New South Wales for some years. The West Indian Islands loomed large on the map of those days.

Coming to more recent times, we find at the outbreak of the Great War that world sugar production had increased to 18 million tons, of which the tropics were supplying a little more than one-half. Of the total world consumption, however, about four-fifths is accounted for in temperate lands. The big consumers are countries like the United States of America, the United Kingdom, Germany, and France. The War caused a great decline in the production of Europe, including Russia, not only by the fact that military operations were carried out over the actual sugar-beet areas, but still more through the general disorganisation of the Continent. By 1920 cane-sugar was supplying 80 per cent. of the total world consumption, and the tropics reaped a rich harvest at the expense of Europe. The world price of sugar soared and a great expansion of the industry took place in countries like Cuba and Java.

Gradually the European beet industry recovered, and the proportions of cane-sugar and beet-sugar, as previously mentioned, are now respectively two-thirds and one-third. This revival in Europe coincided with the coming into full production of new plantations in the tropics which had been stimulated by the war price of sugar. The result has been serious over-production, leading to an unprecedented depression in world sugar prices.

Sugar's Present Position.

We can now survey more closely the position as it is to-day in various parts of the world.

Starting with Europe, we find some fifteen different countries producing beet-sugar in quantities more or less sufficient for their own needs. Chief amongst these are France, Germany, and Czechoslovakia.

The position in Great Britain requires special consideration. Her consumption is over two million tons of sugar per annum, an increasing proportion of which is now being derived from her own beet industry. This industry has been gradually established only during the last ten years or so, but annual production now approximates half-a-million tons. The cost to the British Treasury, however, represents some £6 millions per annum. It is a remarkable example of the trend in Britain towards self-sufficiency as regards food production, irrespective of purely economic considerations. The general policy of Great Britain with regard to sugar affords also an interesting example of how the normal flow of commerce may be completely changed by tariffs and other similar measures. Twenty years ago she was importing the whole of the two million tons she required, 80 per cent. of which was beet-sugar from the Continent. To-day she is providing 25 per cent. of her requirements within her own borders. Nearly 40 per cent. of the imported sugar (representing three-quarters of a million tons) is derived from Empire sources, Australia and South Africa and the Crown Colonies of Mauritius, the West Indies and British Guiana all contributing their share. The balance is obtained from tropical countries such as Cuba and Peru.

This diversion of supplies has been effected through a tariff designed to exclude refined sugar and at the same time to encourage the importation of raw cane-sugar from Empire sources. It should be mentioned

here that Great Britain's total imports of sugar are still actually two million tons, but she now re-exports about 400,000 tons in the form of refined sugar. The various sources of her supply of this commodity and her general policy in relation thereto afford a most interesting lesson in economic geography, international trade, and the effects of tariff policies.

As to future developments, in the European beet countries the principal areas of production are already fully exploited. The greatest potentialities in the beet zone are within the vast area covered by the Soviet Union of Russia. Production in a normal year under present conditions would be about one and a-half million tons of sugar, leaving some for export. According to the second five-year plan, production is to reach seven million tons by 1937. This may appear excessive, but it should be remembered that the main objective of the first five-year plan was to develop a highly industrialised economy. Everything, including agriculture, was sacrificed to this. In the future, we may expect to see more attention given to the agricultural resources of the country, including the beet-sugar industry. There is apparently an almost unlimited area of land available for beet cultivation. A recent official report, for example, states that new sugar factories are under construction in Central Asia and in Southern Siberia. This serves to remind us that the area covered by the U.S.S.R. is equal to that of the whole British Empire. The population is at least 150 millions, increasing at the rate of two millions per annum, and the present level of consumption per capita is very low.

We next turn our attention to the United States of America, including those islands which are under her jurisdiction. Normal consumption within the United States of America is six million tons per annum. Like Great Britain, she obtains about one-fourth of her requirements from her own domestic beet industry, supplemented, however, by a certain amount of cane-sugar produced by the Southern States of the Union. The balance, all in the form of cane-sugar, is imported from Cuba and from her oversea possessions, the island of Puerto Rico, the Hawaiian Islands, and the Philippine Islands. The United States of America in the past has indulged in an expansionist policy and, like Great Britain, she has commercial Empire problems of her own. These are concerned very largely with the sugar industry. The problem of the Philippines affords good illustration of this. These islands formerly belonged to Spain, and following on their acquisition by the United States of America, a great expansion took place in the production of sugar, which had become entitled to the right of free entry into the States. This expansion was not favourably regarded by opposition sugar interests in the United States of America, who used all their influence to further the movement for granting independence to the Filipinos This is now due to take place in ten years' time, when the right of free entry into the United States of America will be finally withdrawn. Philippine sugar will then have to face the open competition of the world's market. An economic reaction seems inevitable which may have far-reaching effects in the political sphere. These islands have been owned by two different nations within the last generation. They are by no means fully exploited and they lie midway in the direct route between Japan and Northern Australia. Japan, it may be mentioned here, obtains most of her sugar from Formosa, an island in the China Sea, which is part of the Japanese Empire. The Empire in this respect now approaches self-sufficiency.

If we follow the tropic zone round the globe, starting with the Philippines, we find that these islands, together with Java, Australia, Hawaii, Cuba, Santa Domingo, Puerto Rico, the West Indies, Peru, and Mauritius, are the principal exporters of sugar. It will be noticed that nearly all these places are islands. The most suitable climate for sugar-cane is one where hot moist weather alternates with periods of hot dry weather. It is very much at home, therefore, in mountainous islands inside the tropics. Of the total world production of cane-sugar 70 per cent. is produced within the tropic zone. Until quite recently Cuba was the outstanding producer of sugar in the whole world, production in that country having reached five million tons in 1929. Great as are its advantages in soil and climate, it was proximity to the United States of America and a favourable tariff with that country that allowed Cuba to develop its natural resources to the full. As production within the tariff wall of the United States of America (including the island possessions) increased, the market for Cuban sugar contracted. The price fell to below cost of production. A scheme for international limitation of production was initiated, but this proved a failure. Then followed a series of political revolutions, the net result of all this being that Cuban production of sugar dropped last year to only two million tons.

Java was, until recently, the next largest producer with three million tons. The industry here is a model of organisation, efficiency, and scientific research, for which the Dutch are responsible. Formerly, all the sugar produced was exported to the Netherlands for refining. With the abolition of tariff preference, this market was lost. For a time Great Britain and the United States of America took the place of the mother country. These markets in turn were lost owing to the trade policies of these two countries. For many years past Java has had to rely mainly on the markets in India, China, and Japan, but recently the growth of protective barriers in the East has jeopardised her market in this quarter of the globe. Last year her production of sugar was little more than half-a-million tons. All the natural geographic advantages possessed by Java and all her efficiency have proved unavailing against the new tariff of India and the developments arising therefrom.

India is the great continental sugar-cane country, the crop being grown chiefly in sub-tropical areas in small plots by peasant cultivators. Methods in agriculture are crude, but a great expansion has taken place during the last two years. Under the shelter of a new protective tariff, modern factories are springing up everywhere. Imports of sugar, formerly one million tons per annum, chiefly from Java, are rapidly approaching vanishing point. India now heads the list of all sugar-producing countries and with a very low cost of production and efficient management she may yet enter the export market.

This completes our brief survey of the sugar world. We started with Europe, crossed to America, traversed the tropics, and ended with India. In dealing with Europe, we touched on the projected extension of the beet industry into Central Asia. This area, it will be noticed, is not far distant on the map from Northern India, so we have thus completed the circle of the globe.

Summary.

Summarising the position with regard to these various countries, we find that India, owing to the decline in the size of the Cuban crop, now

holds the leading position amongst sugar producers. In the production of beet-sugar, the U.S.S.R. has by far the greatest potentialities. Neither India nor Russia, however, is in a position at present to export. If that stage should ever be reached by both these countries, a new and interesting phase of the rivalry between beet-sugar and cane-sugar may be looked for. The production of India is based on individual peasant economy, backed largely by British capital and British technique in the factory. The production of Soviet Russia is on a collectivist basis with mechanisation applied to the field. Mass production in agriculture, in fact, is contemplated. All this, however, is a matter of speculation, and lies somewhat outside the realm of statistics and economic geography.

So far as the other principal countries are concerned, the following summary represents some of the recent trends in production during the last five years. The output of Cuba and Java taken together has declined by over 60 per cent., while that of India has increased by more than 60 per cent. Production of sugars within the United States of America, including its overseas territories, has increased by 50 per cent. Similarly, the increase within the British Empire, taken as a whole, but exclusive of India, amounts to 30 per cent. The production of beet-sugar throughout Europe generally has declined by 20 per cent. The position of Cuba and Java emphasises the fate that to-day awaits an export country which lives in economic isolation. It is countries which live within protected groups, such as the British Empire or the United States of America, that have been able to expand production. Recently, within these two groups competition for the market of the motherland, as between members of each group, has become manifest. Both Great Britain and the United States of America are now faced with the problem of allocating quotas amongst the various members of their respective families. The flow and direction of international trade increasingly depends upon such things as commercial treaties, preferences, and import quotas.

Australia.

Finally there remains Australia to be considered. Here we have a series of widely separated cane districts stretching from latitude 17 deg. in Queensland to the 30th parallel in New South Wales. The industry originally started in sub-tropical areas, but as the Northern districts became more accessible, it gravitated naturally to the tropics. About 85 per cent. of the total Australian production of sugar is now within the tropic zone. To show the climatic range in Australia, it may be mentioned that beet-sugar to a small extent is being produced at Maffra in Victoria. Incidentally, this appears to be the only beet-sugar produced in the Southern hemisphere.

As in many other countries, the industry here is protected on national grounds, but these grounds have a special validity in the case of Australia. As the present Prime Minister recently stated, the people willingly subscribe to the cost of the sugar industry, because they believe in the White Australia policy. They do so on particular national grounds because on the coastal margin of North Queensland it it sugar or nothing. Under this policy the industry has expanded to a remarkable degree. A considerable export trade has been built up with the mother country under a preferential tariff designed to encourage the production of sugar within the Empire. Production is now over 600,000 tons per annum. Australia, in fact, is to-day the largest producer of

sugar within the British Empire, except only India. A similar development of the industry has been noted in the various overseas possessions of the United States of America.

A feature that has been generally overlooked is the tendency of Australia towards imperial expansion on its own account. The Australians are an enterprising race with a genius for putting names on the map. Not content with their own vast continent, they have explored Antarctica and acquired Papua. Their energies range from the Equator to the South Pole. In this sugar has played its part. It was from New Guinea many years ago that a Queensland expedition obtained the best variety of sugar-cane then known to the world. Individual Queenslanders in recent years have successfully established the industry in Kenya, East Africa, just below the Equator, at a height of 4,000 feet above sea-level. In the South Pacific Australia has established a species of Monroe doctrine. The Fiji Islands, for instance, a British Crown Colony, are practically owned by Australia. The sugar industry is the backbone of these islands, and the industry there is an entirely Australian enterprise.

The features just mentioned are in conformity with the general history and development of most cane-sugar countries. The unique feature that distinguishes the Australian industry is that it embodies in itself a definite national policy, and this has resulted in the achievement of something that is new in the history of the world. The white races have frequently invaded the tropics, but in almost every region their penetration failed. Now we are told by Dr. Grenfell Price, a leading authority on the subject, that "to the utter astonishment of the scientists of all nations we have established a working population of 150,000 white people in North-Eastern Queensland—the largest population of working Nordics in any part of the tropics." Apart from any question of material production or economic geography, this is an achievement of which Australia in general, and Queensland in particular, can be justly proud.

STUD PIG PURCHASES.

Included among prize-winning stock from the Melbourne Centenary Show purchased by Queensland breeders of stud pigs are a pair of very fine quality Berkshire sows secured by Miss Jean Handley on behalf of the Bon Vale Stud at Murphy's Creek. The purchases include the first prize Berkshire sow in class four months old and under. This sow, "Clethorpe's Rosie" was bred by that well-known stud master, Mr. T. White, of Clethorpe, Victoria. She is a nice lengthy sow with a nice head and well developed quarters. Another sow, "Dookie Elsa," a product of the stud at Dookie Agricultural College, is sired by "Dookie Valet" (8876), and from "Dookie Disdain" (11602), both well-known families unrelated to those bred by Mr. T. White.

Other purchases were made on behalf of Mr. W. S. Hendry, of the Ascot Vale Stud, Clifton, and by Mr. Percy V. Campbell, of Lawn Hill, Lamington, Queensland, who with Mr. J. A. Heading, of Murgon, attended the Melbourne Show and Stud Pig Breeders' Society meetings as delegates from the Queensland branch of the Stud Pig Breeders' organisation. Mr. Heading also made some purchases for his Highfields Stud.

The periodical introduction of fresh breeding stock of improved type does much to assist, but there is a big field of work ahead, and it is hoped before very long a much more representative shipment of stud pigs will be secured from countries overseas, for the pig industry has developed to such an extent and is of such importance as to warrant money being spent in introducing further stock.

CROP PLANTING TABLES FOR QUEENSLAND.

NUMBER OF PLANTS REQUIRED TO PLANT AN ACRE OF GROUND AT GIVEN DISTANCES.

	Plants.		Plants.
3 in. × 12 in.	174,240	18 in. × 42 in.	8,297
6 in. × 6 in.	174,240	18 in. × 48 in.	7,260
6 in. × 9 in.	116,160	20 in. × 24 in.	13,068
6 in. × 12 in.	87,120	20 in. × 30 in.	10,454
9 in. × 9 in.	77,440	20 in. × 36 in.	8,712
9 in. × 12 in.	58,080	20 in. × 42 in.	7,467
12 in. × 12 in.	43,560	20 in. × 48 in.	6,534
12 in. × 15 in.	34,848	2 ft. × 2 ft.	10,890
12 in. × 18 in.	29,040	2 ft. × 3 ft.	7,260
12 in. × 24 in.	21,780	2 ft. × 4 ft.	5,445
12 in. × 30 in.	17,424	2 ft. 6 in. × 3 ft.	5,808
12 in. × 36 in.	14,520	3 ft. × 3 ft.	4,840
12 in. × 42 in.	12,446	3 ft. × 4 ft.	3,630
12 in. × 48 in.	10,890	3 ft. 6 in. × 3 ft.	4,148
15 in. × 18 in.	23,232	4 ft. × 5 ft.	2,178
15 in. × 24 in.	17,424	4 ft. × 6 ft.	1,815
15 in. × 30 in.	13,939	4 ft. × 8 ft.	1,361
15 in. × 36 in.	11,616	4 ft. × 10 ft.	1,089
15 in. × 42 in.	9,956	4 ft. × 12 ft.	907
15 in. × 48 in.	8,712	6 ft. × 6 ft.	1,210
18 in. × 18 in.	19,360	6 ft. × 8 ft.	907
18 in. × 24 in.	14,520	6 ft. × 10 ft.	726
18 in. × 30 in.	11,616	6 ft. × 12 ft.	605
18 in. × 36 in.	9,680		

The omission of the last figure will give the number required for 16 perches.

TABLE OF EQUIVALENT QUANTITIES OF MANURES.

Per Acre.	Per Square Perch, Approx.	Per Square Yard, Approx.
1 ton	14 lbs.	7½ ozs.
10 cwt.	7 ,,	3¾ ,,
5 ,,	3½ ,,	2 ,,
4 ,,	2¾ ,,	1½ ,,
3 ,,	2 ,,	1 ,,
2 ,,	1½ ,,	
112 lbs.—1 cwt.	11¼ ozs.	
84 ,,	8½ ,,	
56 ,,	5½ ,,	
28 ,,	2¾ ,,	

1 Dessert-spoonful equals about 1 oz.

SOUTHERN DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	Tableland Districts.	Inland Districts.	How Sown or Planted. Distance Rows Apart. Ft.	In.	Distance between Plants. Ft	In.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Arrowroot	Farina and pig food ..	Aug. to Oct.	..	..	5	0	2	0	Tubers or "bulbs" 10 to 12 cwt.	..	8 to 10	Suited only to coastal districts. Tropical and semi-tropical.
Artichoke (Jerusalem)	Market sale and pig food	Aug. to Oct.	Sept. to Oct.	..	3	6	1	6	4 to 5 cwt.	..	4 to 5	
Asparagus	Market sale	Aug. to Sept.	Sept.	..	4	0	1	6	7,260 roots	..	18	May also be propagated from seed sown thinly in drills and transplanted when large enough.
Barley, Cape and Skinless	Green feed	Mar. to June	Mar. to July	Mar. to June	..		..		1 bushel ..	1½ bushel ..	2 to 4	
Barley, Malting ..	Grain	..	May and June	May and June	..		..		1 bushel ..	1½ bushel ..	4½ to 5	
Beans, Broad ..	Market sale	May to June	Apr. to May	May to June	2	6	0	6	2 bushels ..	..	4½ to 5	
Beans, French ..	Market sale	Sept. to Apr.	Oct. to Mar.	Sept. to Mar.	2	6	0	6	35 lb. small 52 lb. large	seeded seeded	2½ to 3	Sowings may be made earlier and later, according to the district's susceptibility to frosts.
Beans, Lima ..	Bush	Sept. to Apr.	Oct. to Jan.	Sept. to Jan.	2	6	0	9	21 lb. small	seeded	3½ to 4	
Do. do. ..	Runner..	Sept. to Apr.	Oct. to Mar.	Sept. to Apr.	4	0	1	0	26 lb. large	seeded		
Beet, Garden varieties	Market sale	Feb. to Apr.	Jan. to Mar.	..	2	0	0	9	4 to 5 lb ..	..	3 to 4	
Beet, Spinach ..	Stock food	Apr. to June	Apr to June	..	2	6	1	0	4 lb ..	..	3 to 4	Foliage of Spinach Beet is reproduced quickly after being cut down and is a profitable crop for fattening purposes.
Broom Millet ..	Fibre for brushware ..	Sept. to Dec.	Oct. to Dec.	Oct. to Dec.	3	6	0	9	4 to 5 lb. ..	..	4½ to 5	
Buckwheat	Bees, green manure, grain, and poultry food	Sept. to Mar.	Sept. to Mar.	Sept. to Feb.	2	0		.	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 to 7 weeks of planting.
Cabbage	Market and cattle food	Nearly all seasons except summer	Nearly all seasons except summer	Nearly all seasons except summer	2	6	2	0	1 lb. ..	..	4 to 5	

Canary Seed ..	Hay and grain ..	..	May to June	May to June	..		..		15 lb. ..	..	4½ to 5	
Capsicum ..	Market sale	Aug. to Oct	Sept. to Oct.	Sept. to Oct.	2	6	1	6	1 lb. ..	..	4 to 5	
Carrot, Field ..	Stock food	Mar. to June	Apr. to May	Mar. to June	1	9	..		2 to 3 lb. ..	..	4 to 5	
Carrot, Garden ..	Market sale ..	Nearly all seasons	Nearly all seasons	Sept. to May	1	6	..		2 to 3 lb.	..	4	
Cassava (Tapioca) ..	Starch or pig food ..	Aug. to Sept.	..	..	5	0	2	0	4,356 cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower ..	Market sale ..	Feb. and Apr.	Feb. to May	Feb. to Mar.	2	6	2	0	1 lb. ..	..	6	
Celery ..	ditto ..	Jan. to Mar.	Jan. to Mar.	..	4	0	0	6	4 oz. ..	..	5 to 6	
Chocos ..	ditto ..	Aug. to Oct.	..	..	Trellis		..		Chocos ..	..	4 to 5	
Cotton ..	Fibre ..	Sept. to Dec.	Sept. to Nov.	Sept. to Nov.	4	0	2	0	10 to 20 lb.	..	5 to 7	Early cultivation is essential to keep down weeds and grass.
Cow Cane ..	Cattle food ..	Sept. to Dec.	..	..	5	0	1	6	5,800 sets	..	7 to 8	
Cowpea ..	Grain, hay, or green manure	Sept. to Jan.	Oct. to Jan.	Oct. to Jan.	3	0	0	8	10 lb. ..	15 to 20 lb.	4 to 4½	The non-running varieties are the most suitable for grain.
Cucumber ..	Market sale ..	Sept. to Jan.	Oct. to Jan.	Sept. to Jan.	5	0	2	0	1 lb. ..	..	3	
Egg Plant ..	ditto ..	Sept. and Oct.	Sept. and Oct	Sept. and Oct	3	0	3	0	1 oz. for 1,000 plants	..	6	
Garlic ..	ditto ..	Aug. to Sept.	Aug. to Sept.	.	1	6	0	6	..	..	6	
Ginger ..	ditto ..	Aug. to Sept.	..	.	3	0	1	0	5 to 6 cwt.	..	10	
GRASSES—												
Cocksfoot ..	Pasture	..	Apr. to May	..	..		..		..	1½ bushel ..		
Elephant Grass ..	Green fodder before the stems harden	Aug. to Oct.	..	..	5	0	2	6	(3,432) cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable. Also propagated from seed.
Italian Rye Grass	Pasture	..	Apr. to May	..	..		.		..	2 bushels		
Paspalum ..	ditto ..	Sept. to Jan.	Sept. to Jan.	..	..		.		..	8 to 10 lb.	4 to 6	Sow in rainy season.
Perennial Rye Grass	ditto .	..	Apr. to May	..			..		.	2 bushels		
Prairie ..	ditto .	Apr. to May	Apr. to May	Apr. to May	.		.		..	1½ to 2 bus.	4 to 5	
Rhodes ..	ditto ..	Sept. to Jan.	Sept to Jan.	Sept. to Jan.	.		.		..	4 to 5 lb. .	4 to 6	Sow in rainy season.
HERBS—												
Lavender ..	Perfume .	Aug. to Sept.	Aug. to Sept	..	4	0	2	0	..	..	12	Propagated from seed or by division of rootlets.
Marjoram .	Seasoning ..	Aug to Sept.	Aug. to Sept.	Aug. to Sept.	2	6	0	6	..	..	3	Propagated from seed or by division of rootlets.
Mint .	ditto ..	Aug. to Sept.	Aug. to Sept.	..	..		..		..	..	2	Propagated by rootlets only.
Parsley ..	ditto ..	Nearly all seasons	Nearly all seasons	..	2	6	..		1 lb. ..	..	2½ to 3½	

SOUTHERN DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant: Coastal Districts.	When to Sow or Plant: Tableland Districts.	When to Sow or Plant: Inland Districts.	How Sown or Planted: Distance Rows Apart.	How Sown or Planted: Distance between Plants.	How Sown or Planted: Quantity Seed per Acre if Drilled.	How Sown or Planted: Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
					Ft. In.	Ft. In.				
HERBS—*continued.*										
Sage	Seasoning	Aug. to Sept.	Aug. to Sept.	..	2 6	0 9	2 lb. ..	..	3	Propagated from seed or by division of rootlets.
Thyme	Seasoning	Aug. to Sept.	Aug. to Sept.	Aug. to Sept.	2 6	0 6	..	..	3	Propagated from seed or by division of rootlets.
Kale	Stock food	Feb. to June	Feb. to June	..	3 0	2 0	1 lb. ..	..	4	
Kohl Rabi	Market sale, stock food	Mar. to Apr.	Mar. to Apr.	..	2 6	1 6	2 lb. ..	..	4 to 5	
Leek	Market sale	Feb. to Apr.	Feb. to Apr.	..	2 6	0 6	2 lb. ..	..	6 to 8	Transplanted when the leeks are the size of goose quills.
Lettuce	ditto	All seasons ..	All seasons ..	..	2 0	0 9	¼ lb. ..	..	3	During dry periods of year sow in drills and thin out.
Linseed (Flax) ..	Fibre and grain ..	May and June	May and June	..	Drilled	..	30 lb. for grain 60 lb. for fibre	..	4½ to 5	Can be treated as an ordinary white cereal crop and harvested with reaper and binder.
Lucerne	Fodder	April to May	April to May	..	Drilled	..	12 to 14 lb.	16 to 20 lb.	1½ to 2	First cutting should take place as soon as the plant will stand up to the mower and before it flowers.
Maize	Grain and silage ..	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 0	1 3	8 to 10 lb.	..	4 to 5	If sown on the "check row" system weeds are more easily dealt with.
Mangel and Sugar Beet	Stock food	Feb. to Apr.	Mar. to June	..	2 6	1 0	5 to 7 lb.	..	6 to 7	
Marrow, Vegetable ..	Market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 to 8 feet	4 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety grown.
Melon, Rock ..	ditto .. .	Aug. to Jan.	Sept. to Dec.	Sept. to Dec.	4 to 6 feet	2 0	1 lb. ..	..	3	Distance apart and time of maturing according to variety.

Melon, Water ..	Market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	4 to 6 feet	2 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Millet, Foxtail varieties, these include the so-called Giant Panicum	Fodder	Sept. to Jan.	Oct. to Jan.	Sept. to Jan.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain and green fodder	Sept. to Jan.	Sept. to Jan.	Sept. to Jan.	Drilled	..	7 to 8 lb. ..	..	1¼ to 2	A useful catch crop.
Mustard	Market sale	All seasons ..	All seasons ..	..	Sown in beds		for salad use	..	..	For farm use, see remarks under Rape.
Oats	Grain and fodder ..	Apr. to June	Apr. to June	Apr. to June	Drilled	..	1½ bushel ..	1½ to 2 bus.	3 to 5	
Onion	Market sale	Apr. to May ..	Mar. to Apr.	Mar. to Apr.	1 0	..	4 lb. ..	..	5 to 6	
Panicum (White) and Japanese Millet	Silage, fodder, and grain	Aug. to Feb.	Sept. to Feb.	Sept. to Feb.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Parsnip	Market sale	Feb. to Mar.	Feb. to Mar.	..	2 0	..	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Mar. to June	Mar. to June	Apr. to June	2 0	..	½ to ¾ bus.	..	4 to 5	Usually combined with a cereal fodder crop.
Pea, Garden	Market sale	Feb. to Sept.	Mar. to Sept.	Mar to June	2 0	..	1½ bushel ..	..	3½ to 4	Period of maturity according to variety used.
Peanut	ditto	Aug. to Jan.	Sept. to Dec.	Sept. to Dec.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	Aug. and Feb	Aug. and Feb.	..	2 6	1 0	8 to 9 cwt.	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Jan.	Sept. to Jan.	Sept. to Jan.	3 to 3½ feet	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Fodder and market sale	Aug. to Jan.	Sept. to Jan.	Sept. to Jan	8 to 10 feet	3 0	2 lb. ..	..	5 or 6	Distance apart and time of maturing varies according to variety.
Radish	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 0 apart	..	10 to 12 lb.	..	1½	
Rape	Fodder and green manure	Mar to May	Mar. to May	..	Drilled	..	5 to 6 lb. .	..	2½ to 4	The addition of 1 lb. of mustard seed to every 5 or 6 lb. will, if sown in conjunction, minimise the tendency of depastured animals to bloat.
Rhubarb	Market sale	Aug. to Oct..	Sept. to Nov.	..	4 0	4 0	1½ lb. ..	..	4 to 5	When propagated from roots quicker returns may be expected.
Rice, Upland ..	Grain and fodder ..	Oct. to Jan.	..	..	Drilled	..	12 to 16 lb.	..	4 to 5	
Rosella	ditto	Aug. to Nov.	Sept. to Oct	..	4 0	3 0	Sow in beds and transplant	..	3 to 4	
Rye	Fodder	Mar. to June	Apr. to June	Apr. to June	Drilled	..	¾ to 1 bushel	..	3 to 5	

SOUTHERN DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.			How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
					Ft. In.	Ft. In.				
Shallots	Market sale	Nearly all seasons	Nearly all seasons	..	1 6	0 6	..	..	3 to 4	Propagated by division of the bulbs.
Sorghum, Feed ..	Fodder and silage ..	Aug. to Feb.	Sept. to Feb.	Sept. to Jan.	3 6	0 8	4 to 5 lb. ..	..	3½ to 5	Maturity depends on variety used.
Sorghum, Grain ..	Grain	Aug. to Feb.	Sept. to Jan.	Sept. to Jan.	3 6	0 8	3 to 4 lb. ..	..	3½ to 5	
Soudan Grass ..	Fodder or silage ..	Sept. to Feb.	Sept. to Jan.	Sept. to Dec.	2 6	..	3 to 4 lb. ..	..	2	Closer planting permissible.
Soy Beans	Grain	Sept. to Jan.	Oct. to Jan.	..	2 6	0 8	8 to 10 lb.	..	3	
Squash	..	*See* Marrows	and Pumpkins.							
Swede	Market sale and stock food	Feb. to May	Feb. to May	..	2 0	1 0	2 lb. ..	..	4 to 5	
Sweet Corn	Market sale	Aug. to Jan.	Sept. to Jan	..	3 6	1 3	8 to 10 lb.	..	3	
Tares	Fodder or green manure	Mar. to June	Mar. to June	..	Drilled	..	1 bushel ..	½ bushel to 1 bushel other grain	3 to 4	For fodder purposes is best used with some form of cereal, such as barley, wheat, or rye.
Tobacco	Leaf	Oct. to Jan.	Oct. to Feb.	Oct. to Jan.	4 0	1 ft. 8 in. to 2 ft.	1 oz. in seed beds	..	3 to 4	Plants must be raised in specially prepared seed beds and transplanted when strong enough to permanent positions.
Tomato	Market sale .. .	Aug. to Feb	Sept. to Jan.	Sept. to Jan	4 0	2 0	¼ lb. ..	..	3 to 4	
Turnip, Field ..	Stock food	Feb. to June	Feb. to June	..	2 0	1 0	2 to 3 lb. ..	..	3 to 4	
Turnip, Garden ..	Market sale	Feb. to June	Feb. to June	..	2 0	0 6	2 lb. ..	..	2 to 3	
Wheat	Grain and hay .. .	Apr. to May	Apr. to July	Apr. to June	Drilled	..	¾ bushel ..	1 bushel ..	3 to 4	Fodder purposes only on coast.

CENTRAL DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
				Ft. In.	Ft. In.				
Arrowroot	Farina and pig food	Aug. to Nov.	..	5 0	2 0	10 to 12 cwt.	..	8 to 10	Propagated by small "bulbs" or tubers.
Artichoke (Jerusalem)	Market sale and pig food ..	Aug. to Nov.	Sept. to Nov.	3 6	1 6	4 to 5 cwt.	..	4 to 5	
Asparagus	Market sale	Aug. ..	..	4 0	1 6	7,260 sets..	..	18	Propagated from seed or division of roots.
Barley (Cape and Skinless)	Green feed	Mar. to June	Mar. to June	Drilled	0 7	1 bushel ..	1½ bushel ..	2 to 4	
Beans, French ..	Market sale	July to Apr.	Sept. to Jan.	2 6	0 6	..	35 lb. small 52 lb. large	2 to 3	
Beans, Broad ..	ditto	May to June	..	2 6	0 6	2 bushels ..	..	4 to 5	
Beans, Lima ..	ditto	July to Jan.	Sept. to Dec.	4 0	1 0	26 lb. large seeded	..	3 to 4	
Beetroot	ditto	Feb. to Aug.	Sept. to Dec.	2 6	0 9	4 to 5 lb. ..	..	3 to 4	
Beet, Silver or Spinach	Market sale or stock food ..	All seasons ..	Apr. to June	2 6	1 0	4 lb. ..	..	3	Useful both as a vegetable and as a stock food.
Broom Millet ..	Fibre for brushware	Aug. to Jan.	Sept. to Dec.	3 6	0 9	4 to 5 lb. ..	..	4 to 5	
Buckwheat	Bees, green manure, poultry food, and grain	Aug. to Jan.	Sept. to Dec.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	Produces a valuable nectar crop within 6 or 7 weeks of planting.
Cabbage	Market sale	Feb. to June	Feb. to June	3 0	2 0	1 lb. ..	..	4 to 5	
Canary Seed ..	Grain or hay	Mar. to June	Mar. to June	Drilled	..	15 lb. ..	..	4½ to 5	Also used as green stuff.
Capsicum	Market sale	Aug. to Nov.	Sept. to Nov.	3 0	2 to 3 ft.	1 lb. ..	..	4 to 4½	Distance apart according to variety.
Carrot, Field ..	Stock food	Mar. to June	Sept. to Jan.	1 9	..	3 lb. ..	..	4 to 5	
Carrots, Garden ..	Market sale	Mar. to June	Sept. to Jan.	1 6	..	3 to 4 lb. ..	..	3 to 4	
Cassava (Tapioca) ..	Starch or pig food	July to Sept.	..	5 0	2 0	Cuttings ..	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	Feb. to May	Feb. to May	3 0	2 0	1 lb. ..	..	5 to 6	
Celery	ditto	Feb. to Mar.	Feb. to Mar.	4 0	0 6	4 oz. ..	..	6	
Chocos	ditto	July to Nov.	Sept. to Nov.	Trellis	6 0	..	..	4	

CENTRAL DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
				Ft. In.	Ft. In.				
Cotton	Fibre	July to Oct.	Sept. to Oct.	4 0	2 to 3 ft.	5 lb.	..	4 to 5	
Cow Cane	Cattle food	Sept. Oct. and in Mar.	..	5 0	1 6	5,800 sets	..	7 to 8	
Cowpea	Hay or green manure	Aug. to Feb.	Sept. to Jan.	3 0	0 8	9 to 10 lb.	15 lb.	4 to 4½	
Cucumber	Market sale	July to Jan.	Aug. to Dec.	4 0	2 0	1 lb.	..	3	
Egg Plant	ditto	July to Oct.	Aug. to Oct.	3 0	1 6	..	1 oz. for 1,000 plants	6	
Garlic	ditto	Mar. to May	..	1 6	4 to 6 in.	..	..	6	
Ginger	ditto	Aug. to Nov.	..	3 0	1 0	5 to 6 cwt.	..	9 to 10	
Grasses—									
Elephant	Green fodder, before the stems harden	Jan. to Mar. Aug. to Oct.	..	5 0	2 6	3,432 cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable. (Also propagated from seed.)
Paspalum	Pasture	Aug. to Dec. Jan. to Mar.	..	..	..	..	8 to 10 lb.	4 to 6	Is established more readily in the wet season, Jan. to Mar.
Prairie	ditto	Mar. to Apr.	..	..	..	..	1½ bushel	4 to 5	Only suitable for localities favoured with winter rains.
Rhodes	ditto	Aug. to Dec.	..	..	..	..	4 to 5 lb.	4 to 6	Seed germinates readily in the wet season, Jan. to Mar., and in cloudy weather.
Kohl Rabi	Market sale	Mar. to May	..	2 6	1 6	2 lb.	..	3 to 4	
Leek	Domestic use	Mar. to May	..	2 6	0 6	2 lb.	..	6 to 8	
Lettuce	Market sale	Mar. to Sept.	..	2 0	0 9	½ lb.	..	3	
Linseed (Flax)	Seed	Apr. to June	..	Drilled	..	25 to 30 lb.	..	4½ to 5	
Lucerne	Hay and green stuff	Apr. to June	..	Drilled	..	12 to 14 lb.	16 to 20 lb.	Perennial	
Maize	Grain and silage	Aug. to Jan.	Sept. to Dec.	4 0	1 3	8 to 10 lb.	..	4 to 5	For silage in forest country and in freshly cleared scrub lands, 10 to 15 lb, of seed per acre.
Mangel and Sugar Beet	Stock food	Mar. to June and in Aug.	Sept. to Oct.	2 6	1 6	5 to 7 lb.	..	6 to 7	

Marrow, Vegetable ..	Market sale	July to Mar.	Sept. to Jan.	4 to 8 ft.	3 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Rock ..	ditto	July to Sept.	Sept. to Oct.	4 to 6 ft.	2 0	1 lb. ..	..	3	Distance apart and time of maturing according to variety.
Melon, Water ..	ditto	July to Oct.	Sept. to Oct.	4 to 6 ft.	2 0	2 lb. ..	..	3 to 4	
Millet, Foxtail varieties, these include the so-called Giant Panicum	Hay and silage	Aug. to Jan.	Sept to Dec.	Drilled	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain and green fodder ..	Aug. to Feb.	Sept. to Jan.	Drilled	..	7 to 8 lb. ..	..	1½ to 2	
Oats	Hay and green stuff	Apr. to June	Apr. to June	Drilled	..	1½ bushel ..	1½ to 2 bus.	4 to 5	
Onion	Market sale	Apr. to June	Apr. to June	1 0	0 4	4 lb. ..	..	6	
Panicum (White) and Japanese Millet	Silage, hay, and green stuff ..	Aug. to Feb.	Aug. to Feb.	Drilled	..	14 to 16 lb.	..	2	Should be cut for hay before seed forms.
Parsley	Market sale	Nearly all seasons	Nearly all seasons	2 6	..	1 lb. ..	..	2½ to 3½	
Parsnip	ditto	Mar. to Apr.	Mar. to Apr.	2 0	0 6	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Mar. to June	Apr. to June	2 0	..	½ to ¾ bus.	..	4 to 5	Invariably sown with a cereal, half bushel field pea, 1 bushel wheat, &c.
Pea, Garden	Market sale	Mar. to June	Apr. to June	2 0	..	1½ bushel ..	..	3½ to 4	Period of growth according to variety.
Peanut	ditto	Aug. to Nov.	Sept. to Nov.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	July and Feb.	Aug. and Feb.	3 0	1 0	8 cwt. ..	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Dec.	Sept. to Nov.	3 to 4 ft.	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Market sale and stock food ..	July to Nov.	Sept. to Nov.	8 to 10ft	4 0	2 lb. ..	..	5 to 6	Distance apart and period of growth varies according to variety.
Radish	Market sale	All seasons ..	All seasons ..	1 0	0 3	10 to 12 lb.	..	1½	
Rape	Fodder and green manuring ..	Mar. to June	..	Drilled	..	3 to 4 lb. ..	6 to 8 lb. ..	4 to 5	Can be grazed off in 6 to 8 weeks. Should be sown with 1 lb. mustard to every 5 or 6 lb. of rape seed to prevent bloat.
Rhubarb	Market sale	Aug. to Sept.	..	4 0	4 0	Roots ..	..	2	
Rice, Upland ..	Grain or hay	Oct. to Dec.	..	Drilled	..	20 lb. ..	..	4 to 5	
Rosella	Market sale	Aug. to Oct.	..	4 0	3 0	..	..	3 to 4	
Rye	Fodder	Mar. to June	..	Drilled	..	¾ bushel ..	..	3 to 5	
Shallot	Market sale	All seasons ..	All seasons ..	1 6	0 6	..	..	..	Propagated by division of the bulbs.
Sorghum, Feed ..	Fodder and silage	Aug. to Feb.	Sept. to Dec.	3 6	0 8	4 to 5 lb. ..	..	3 to 4	Period of growth varies according to variety.

CENTRAL DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant.		How Sown or Planted.				Approximate Period of Growth of Crop in Months.	Remarks.
		Coastal Districts.	Tableland and Inland Districts.	Distance Rows Apart.	Distance between Plants.	Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcasted.		
				Ft. In.	Ft. In.				
Sorghum, Grain ..	Grain	Aug. to Feb.	Sept. to Dec.	3 6	0 8	4 lb. ..	..	4	Period of maturing according to variety.
Soudan Grass ..	Hay or silage	Aug. to Jan.	Sept. to Dec.	2 6	..	3 to 4 lb. ..	..	2 to 3	On clean land drills may be 14 in. apart, 8 to 9 lb. of seed being required.
Soy Beans	Grain	Aug. to Jan.	..	2 6	0 8	10 lb. ..	..	3 to 4	
Squash	..	..	..	..	..	*See* Marrows and Pumpkins.			
Sunflower	Grain	Aug. to Nov.	Sept. to Nov.	4 0	1 6	6 lb. ..	..	4 to 5	
Swede	Market sale and stock food ..	Mar. to June	..	2 0	1 0	2 to 3 lb. ..	..	3 to 4	
Sweet Corn	Market sale	Aug. to Jan.	Sept. to Jan.	3 to 4 ft.	1 0	8 to 10 lb.	..	3	Should be planted when the flowering season will not coincide with that of ordinary maize planted alongside.
Tares	Fodder or green manure ..	Mar. to June	..	Drilled	..	1¼ bushel ..	½ bushel with 1 bushel cereals	4	
Tobacco	Leaf	Oct. to Jan.	Oct. to Feb.	4 0	1 ft 8 in. to 2 ft.	1 oz. in seed beds	Transplanted	3 to 4	
Tomato	Market sale	All seasons ..	Aug. to Dec.	4 0	2 0	¼ lb. ..	Transplanted	3 to 4	
Turnip, Field ..	Stock food	Mar. to June	..	2 0	1 0	2 to 3 lb. ..	..	3	
Turnip, Garden ..	Market sale	Mar. to July	..	2 0	0 6	2 lb. ..	..	2 to 3	
Wheat	Hay or green fodder	Apr. to June	Apr. to June	Drilled	..	1 bushel ..	1½ bushel ..	4 to 5	For costal districts, only rust-resisting hay wheats suitable.

NOTES ON NORTHERN SEED TABLES.

The Northern districts vary greatly in their rainfall; also in the quantities that fall in each month. Thus, on the coastal strip Mackay and Proserpine enjoy a greater and better distributed rainfall than Bowen, the lower Burdekin, and Townsville; while from Ingham through to Cairns much the heaviest rainfall in the State is experienced. Similarly, on the Tablelands certain areas, such as Ravenshoe, Millaa Millaa, and along the watershed of the Johnstone and Russell Rivers and near the crest of the coastal range, a much heavier and better distributed rainfall obtains than a little further back.

The inland districts are not so variable as the coastal areas in their periods and quantity of rainfall.

The compilation of the present table must be looked at as a general guide and sowings made with regard to the season generally experienced in a particular locality. Generally, crops are best planted at the commencement of the monsoonal rains or wet season, starting usually in November or December. Other plantings are made towards the close of the wet season or when extra heavy rains will not cause injury to the growing crop. When about to plant, growers should consider the month the crop is likely to be harvested and arrange accordingly.

In districts of heavy rainfall many root crops, even on well-drained land, are liable to rot out. In potato planting on the Tablelands and inland it is advisable to plant before the wet season commences. The tubers will make a certain amount of root-growth, and shoots will appear on the surface in a short time after the first shower. Growth is then rapid, and when the heavier rains fall the foliage can better cope with excess moisture. The crop planted before the wet season begins always gives a heavier yield and better tubers than one planted after it.

On the Tablelands another planting can be made in February or March. Seed grown from this crop can be held for planting the main crop in October.

It is well to note that whole sets are always preferable in North Queensland to cut tubers.

In the inland districts where irrigation is practised the planting season in many instances can be extended, but due regard must be held of the likelihood of frosts.

NORTHERN AND TABLELAND DISTRICTS.

Sowing and Planting Table for Farm and Market Garden Crops.

(This Table requires to be adapted to suit individual circumstances.)

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	When to Sow or Plant. Tableland Districts.	When to Sow or Plant. Inland Districts.	How Sown or Planted. Distance Rows Apart.	How Sown or Planted. Distance between Plants.	How Sown or Planted. Quantity Seed per Acre if Drilled.	How Sown or Planted. Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
					Ft. In.	Ft. In.				
Arrowroot	Farina and pig food ..	Aug. to Nov.	Aug. to Jan.	Oct. to Jan.	5 0	3 6	2,000-2,500 sets	..	8 to 10	Fresh land should be planted each year.
Artichoke (Jerusalem)	Stock food	July to Aug.	July to Dec.	July to Dec.	3 6	1 6	4 to 5 cwt.	..	4 to 5	Difficult to store; will keep better in the soil.
Asparagus	Domestic use	..	Sept. ..	..	4 0	1 6	7,260 roots	..	..	Suited only to the Tablelands and comparatively cooler districts.
Barley, Cape and Skinless	Green feed	Mar. to June	Feb. to June	Feb. to Apr.	..	..	1 bushel ..	1½ bushel ..	3	
Beans, French ..	Market sale .. .	Apr. to Aug.	Aug. to Apr.	Feb. to Aug.	2 0	0 6	1 qt. to 100 ft. of drill	..	2½ to 3	
Beans, Lima ..	ditto	Mar. to Apr.	Dec. to Jan.	Nov. to Jan.	4 0	1 3	26 lb. ..	..	4 to 5	Only advisable as a field crop where fine weather can be depended on for harvesting.
Beet, Silver or Spinach	Stock food	Mar. to Aug.	Feb. to Sept.	Feb. to July	2 6	..	4 to 5 lb. ..	..	3	
Beetroot	Domestic use	Mar. to Aug.	Feb. to Sept.	Feb. to July	2 6	0 9	4 lb. ..	..	3	
Broom Millet ..	Brushware	Feb. to Mar.	Dec. to Feb.	Dec. to Feb.	3 4	0 9	4 to 5 lb. ..	..	4	
Buckwheat	Fodder, grain, and green manure	..	Dec. to Apr.	Dec. to Apr.	2 0	..	25 to 30 lb.	40 to 45 lb.	1½ to 2½	
Cabbage	Market sale	Feb. to July	Jan. to Aug.	Jan. to Aug	2 6 to 3 0	2 0	1 lb. ..	..	4	
Capsicum	Domestic use	Apr. to Oct.	Aug. to Oct.	Aug. to Oct.	3 0	2 0	1 lb. ..	..	4 to 5	Where districts are free from frost these may be planted all the year round.
Carrots, Field ..	Stock food	Apr. to Sep.	Feb. to Sept.	Feb. to Apr.	2 0	..	3 to 4 lb. ..	..	4 to 5	
Carrots, Garden ..	Market sale	Feb. to Oct.	Feb. to Oct.	Feb. to Oct.	1 6	..	4 lb. ..	..	4	

Cassava (Tapioca) ..	Starch, or pig food .	July to May	Sept. to Jan.	..	5 0	2 0	4,356 cuttings	..	8 to 10	Boil before using. The water in which roots are boiled should not be used.
Cauliflower	Market sale	April to May	Jan. to May	Jan. to May	3 0	2 0	1 lb. ..	..	5 to 6	
Celery	Domestic use	..	Jan. to Mar.	..	4 0	0 6	4 oz. ..	..	5 to 6	
Chocos	Market sale	July to Oct.	Aug. to April	Aug. to Apr.	Trellis	6 0	..	..	4 to 5	
Cotton	Fibre	Feb. to July	Sept. to Jan.	Sept. to Jan.	4 0	2 0 to 3 0	5 to 6 lb. ..	..	4 to 5	
Cow Cane	Fodder	Oct. to May	Oct. to May	Oct. to Apr.	5 0	2 0	..	4,356 sets..	7 to 8	
Cowpea	Fodder and green manure	Aug. to May	Sept. to Feb.	Nov. to Feb.	3 0	..	10 lb. ..	15 to 20 lb.	4½	
Cucumber	Market sale	Nearly all seasons	Nearly all seasons	..	5 0	2 0	1 lb. ..	..	3	Where districts are free from frosts these can be planted all the year round.
Egg Plant	Domestic use	Mar. to July	Nov. to Feb.	Nov. to Feb.	3 0	3 0	1 oz. for 1,000 plants	..	6	
Garlic	Market sale	Mar. to May	Aug. to Sept.	..	1 6	0 6	..	..	6	
Ginger	ditto	Aug. to Nov.	Oct. to Jan.	Oct. to Jan.	3 0	1 0 to 1 6	5 to 6 cwt.	..	10	.
GRASSES—										
Elephant	Green fodder before the stems harden	Aug. to Oct.	Aug. to Oct.	..	5 0	2 6	3,432 cuttings of stem	..	4 to 5	Can be cut at intervals during each season until unprofitable (also propagated from seed).
Panicum muticum	ditto	Aug. to May	Aug. to May	..	6 0	6 0	Rootlets ..	..	4 to 5	
Paspalum .	Pasture..	Early rains ..	Early rains ..	Early rains .	..	.	..	8 to 10 lb.		
Prairie	ditto	..	Mar. to Apr.	..	..		..	30 to 40 lb.	4 to 5	
Rhodes	ditto	Early rains .	Early rains or mid wet season	Early rains	..		..	4 to 5 lb. ..	4 to 6	Sow in rainy season.
HERBS—										
Lavender	Perfume .. .	Mar. ..	Aug. to Sept.	..	4 0	2 0	..	..	..	Propagated from seed or by division of rootlets.
Marjoram . ..	..	..	Aug. to Sept.	..	2 6	0 6	..	..	..	3 months from rootlets.
Mint	..	Aug. .	Aug. to Sept.	.	..	.	..	..	..	
Sage	..	..	Aug. to Sept.	..	2 6	0 9	..	..	..	3 months from rootlets.
Thyme . ..	..	..	Aug. to Sept.		2 6	0 6	..	.	..	3 months from rootlets.
Kohl Rabi . ..	Market sale	Mar. to Apr.	Feb. to Apr.	Feb. to Apr.	2 6	1 6	2 lb. ..	..	4 to 5	
Leek	Domestic use . ..	Mar. to May	Feb. to Apr.	Feb. to Apr	2 0	0 6	2 lb. ..	..	..	Suited only to the cooler districts of the North. Have seen good leeks on the coast, also inland in the North.
Lettuce . .	Market sale .. .	Mar. to Aug.	Mar. to Sept.	Mar. to Aug.	2 0	0 9	¼ lb. .	..	3	
Linseed (Flax) .	Grain	..	Jan. to Feb.	.	..	..	30 lb.	..	5	
Lucerne	Fodder	Mar. to Apr.	Feb. to May	Feb. to May	Drilled	..	12 to 14 lb.	16 to 20 lb.	Perennial	

NORTHERN AND TABLELAND DISTRICTS—*continued.*

Crop.	Purpose for which Grown.	When to Sow or Plant. Coastal Districts.	When to Sow or Plant. Tableland Districts.	When to Sow or Plant. Inland Districts.	How Sown or Planted. Distance Rows Apart. (Ft. In.)	How Sown or Planted. Distance between Plants. (Ft. In.)	How Sown or Planted. Quantity Seed per Acre if Drilled.	How Sown or Planted. Quantity Seed per Acre if Broadcasted.	Approximate Period of Growth of Crop in Months.	Remarks.
Maize	Grain and silage ..	Feb. to Aug.	Nov. to Jan.	Nov. to Jan.	4 0	1 6	8 to 10 lb.	..	4 to 5	
Mangel and Sugar Beet	Stock food	..	Feb. to Mar.	..	2 6	1 3	5 to 7 lb. ..	..	6 to 7	
Marrow, Vegetable ..	Market sale	Sept. to Feb.	Nov. to Feb.	..	4 to 8 ft.	3 0	2 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Rock ..	ditto	July to Feb.	Nov. to Feb.	Aug. to Feb.	4 to 6 ft.	2 0	1 lb. ..	..	3 to 4	Distance apart and time of maturing according to variety.
Melon, Water ..	ditto	July to Feb.	Aug. to Jan.	Aug. to Jan.	4 to 6 ft.	2 0	2 lb. ..	..	3 to 4	
Millet, Foxtail varieties, these include the so-called Giant Panicum	Fodder	Oct. to Mar.	Aug. to Mar.	Dec. to Feb.	..	..	10 to 14 lb.	..	2	Should be cut for hay before the seed forms.
Millets, French ..	Grain	..	Aug. to Feb.	..	..	..	8 to 10 lb.	..	1½	No good in tropics
Oats	Green feed	May to June	Mar. to June	Feb. to Apr.	..	..	1¼ bushel ..	1½ to 2 bus.	4 to 5	
Onion	Market sale	Mar. to May	Mar. to May	Mar. to Apr.	1 0	..	4 lb. ..	..	5 to 6	
Panicum (White) and Japanese Millet	Silage, hay, and green fodder	Oct. to May	Sept. to Mar.	Oct. to Mar.	..	..	14 to 16 lb.	..	2	
Parsley	Market sale	Mar. ..	Feb. ..	Feb. ..	2 6	..	1 lb. ..	..	2½ to 3½	
Parsnip	ditto	Feb. to Apr.	Jan. to Apr.	Jan. to Apr.	2 0	0 9	1 lb. ..	..	6 to 7	
Pea, Field	Fodder	Apr. to June	Feb. to June	Mar. to Apr.	2 0	..	½ to ¾ bus.	..	4 to 5	Usually combined with a cereal fodder crop.
Pea, Garden	Market sale	Mar. to May	Feb. to June	Mar. to May	2 0	..	1½ bushel	..	4	Period of maturing according to variety.
Peanut	ditto	Nov. to Mar.	Nov. to Feb.	Nov. to Feb.	3 0	1 3	30 to 35 lb.	..	5	
Potato	ditto	Mar. to June	Oct. to Dec. Feb. to Mar.	Oct. to Dec. Feb. to Mar.	3 0	1 0	8 cwt. ..	..	3 to 4	
Potato, Sweet ..	ditto	Aug. to Mar.	Oct. to Feb.	Oct. to Feb.	3 to 3½ ft.	1 6	9,000 cuttings	..	3 to 4	
Pumpkin	Market sale and stock food	Mar. to Apr. and from Aug. to Nov.	Nov. to Feb.	Nov. to Feb.	6 to 8 ft.	3 to 4 ft.	2 lb. ..	..	5 to 6	Distance apart and period varies according to variety.
Radish	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 0	..	10 to 12 lb.	..	1½	

Rape	Fodder and green manure	Apr. to July	Mar. to May	Mar. to Apr.	..	..	5 to 6 lb. ..	..	4 to 5	
Rhubarb	Market sale	Aug. to Sept.	Sept. to Nov.	Sept. to Nov.	4 0	4 0	1½ lb. ..	..	4 to 5	When propagated from roots quicker returns may be expected.
Rice, Upland ..	Grain	Sept. to Apr.	Oct. to Feb.	Oct. to Jan.	Drilled	..	12 to 16 lb.	40 to 50 lb.	4 to 6	Harvest when half seed head is yellow. Stack and thresh after 6 weeks.
Rosella	Market sale	Sept. to Feb.	Oct. to Feb.	Oct. to Jan.	3 to 4 ft.	3 0	..	..	3 to 4	
Rye	Fodder	Mar. to July	Mar. to June	Mar. to May	Drilled	..	¾ to 1 bus.	..	4	
Shallot	Market sale	Nearly all seasons	Nearly all seasons	Nearly all seasons	1 6	0 6	..	..	3 to 4	
Sorghum, Feed ..	Fodder and silage ..	Nov. to May	Nov. to Mar.	Nov. to Feb.	3 6	0 8	4 to 5 lb. ..	..	3 to 4	
Sorghum, Grain ..	Grain	Nov. to May	Nov. to Mar.	Nov. to Feb.	3 6	0 8	3 to 4 lb. ..	..	4	
Soudan Grass ..	Hay or silage	Early rains ..	Early rains ..	Early rains ..	2 6	..	3 to 4 lb. ..	..	2	
Soy Beans	Grain	May to July	Sept. to Jan.	Sept. to Jan.	2 6	0 8	10 lb. ..	..	3	
Swede	Market sale	Mar. to May	Feb. to May	Feb. to Apr.	2 0	1 0	2 to 3 lb. ..	..	4 to 5	
Sweet Corn	ditto	Aug. to Jan.	Nov. to Jan.	Nov. to Jan.	3 6	1 0	8 to 10 lb.	..	3	
Tares	Fodder or green manure	Same as Field Peas.		..	..	..	1½ bushel ..	½ bushel with 1 bushel of other grain	4	For fodder purposes it is best sown with some other form of cereal.
Tobacco	Leaf	Oct. to Jan.	Oct. to Dec.	Oct. to Dec.	4 0	1 ft. 8 in to 2 ft.	1 oz. in seed bed	..	3 to 4	Seeds must be sown in specially prepared seed beds and transplanted during period.
Tomato	Market sale	Feb. to July	Nov. to July	Nov. to July	4 0	2 0	¼ lb. ..	..	3 to 4	
Turnip, Garden ..	ditto	Apr. to June	Feb. to May	Mar. to May	2 0	0 6	2 lb. ..	..	2 to 3	
Wheat	Hay, or green fodder..	Mar. to June	Feb. to June	Mar. to May	Drilled	..	40 to 60 lb.	..	4 to 5	Fodder purposes only.

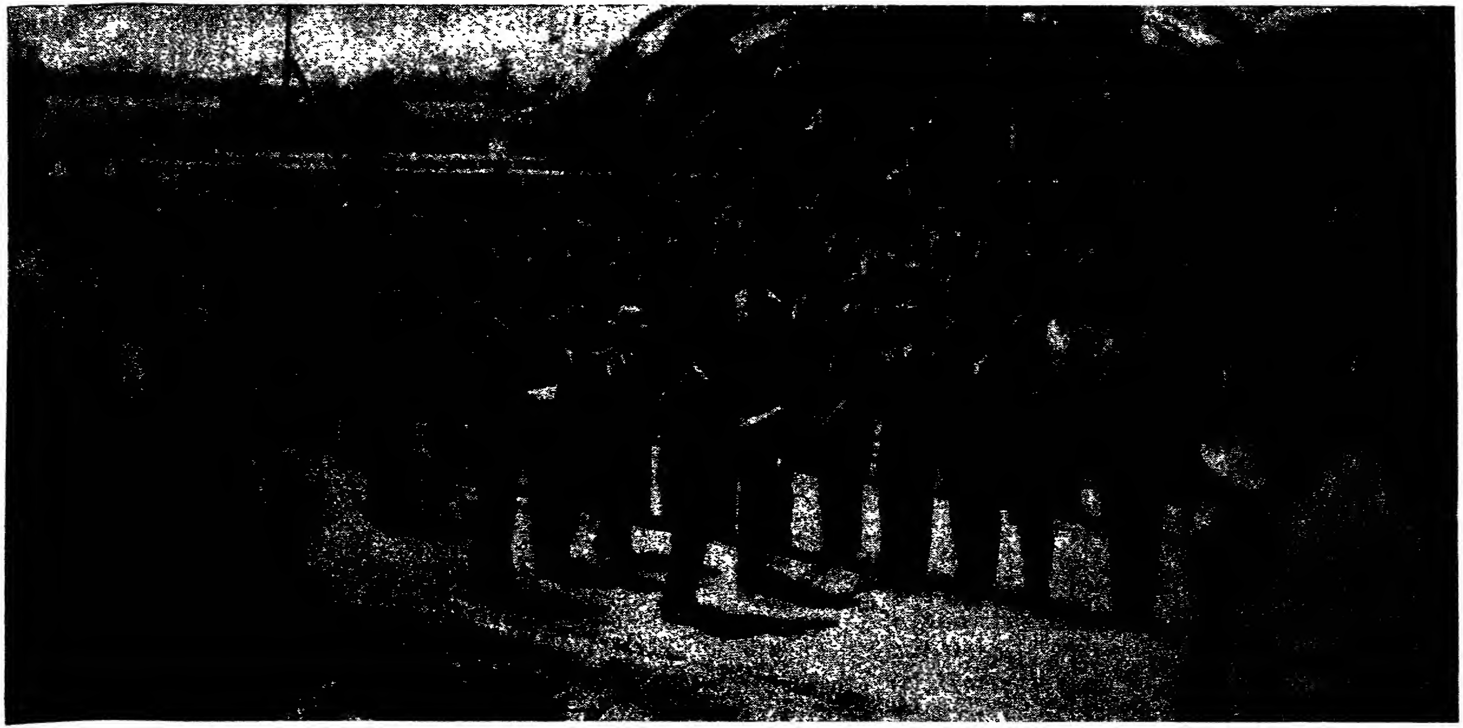


PLATE 48.

PRESENTATION OF STAFF AND STUDENTS OF THE AGRICULTURAL COLLEGE TO H.R.H. THE DUKE OF GLOUCESTER.

Not only once or twice, but even thrice, the Duke of Gloucester mentioned to His Excellency the Governor (Sir Leslie Wilson), how pleased and impressed he was with the work, both practical and theoretical, which, on his visit to the Q.A.H.S. and College, at Gatton, on 4th December, he noted was being done for the people of Queensland,

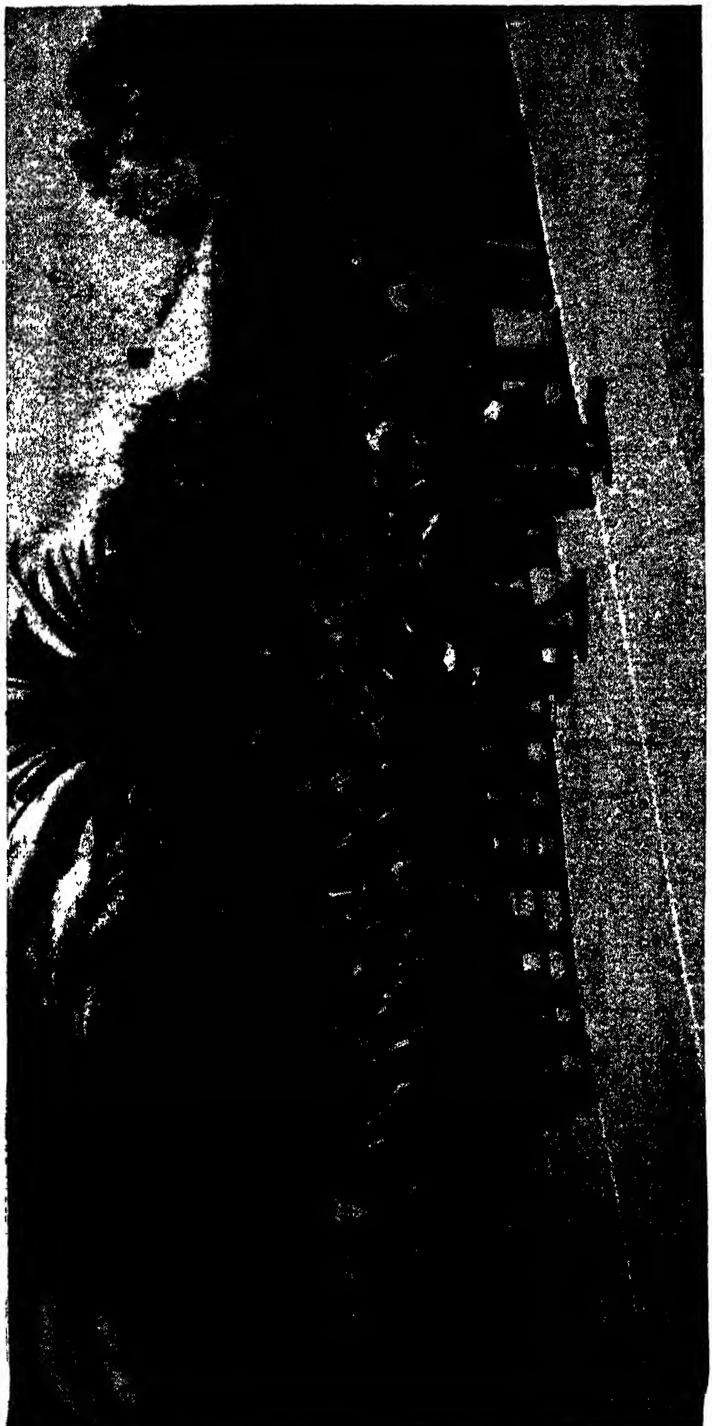


PLATE 49.

ROYAL VISIT TO QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, 4TH DECEMBER.

H.R.H. the Duke of Gloucester meeting Students and Staff in the College Grounds. Accompanying the Duke are the Premier (Hon. W. Forgan Smith), the Minister for Public Instruction (Hon. F. A. Cooper), and Professor J. K. Murray, Principal.

NEW HIGHWAYS IN QUEENSLAND.

THE WORK OF THE MAIN ROADS COMMISSION.

THE Thirteenth Annual Report of the Commissioner for Main Roads, Mr. J. R. Kemp, is an impressive record of rural development in Queensland. During the year considerable progress was made in extensive developmental projects in every division of the State, as indicated in Mr. Kemp's notes on his inspectional visits—an interesting feature of his report. Up to 30th June last 2,645 miles, comprising works of various types, from clearing and drainage to concrete and bitumen surfacing, had been completed; while 458 miles were under construction at that date, together with 83 miles of works to convert previously constructed roads to a higher type.

Works were undertaken in 139 Local Authority areas, and a maximum number of 3,550 men per month were employed.

In general, works are proceeding at the rate of about 1½ mile of road completed per working day. In addition to the road mileage shown above, about 9 miles of bridges have been constructed, and 3,307 feet are in hand. There are now 10,568.7 miles gazetted under the Main Roads Acts—including State Highways, 2,263.63, Main roads 7,839.14, developmental roads 292.45, and tourist roads 173.48.

It has not been possible to undertake construction on all of these roads during the year, but endeavours are being made to spread the expenditure of funds over as wide an area as possible.

Where permanent works have not been undertaken maintenance funds have been provided in order to keep the roads in a reasonably trafficable condition.

Consultations with Local Authorities are constantly taking place so as to ensure that the works of greatest urgency are first undertaken, and gradually the links are being forged together into a chain of roads extending over the length and breadth of the State.

Through the courtesy of the Commission we are able to reproduce a series of excellent illustrations, taken from the report, and which indicate the immense value of a great community service.

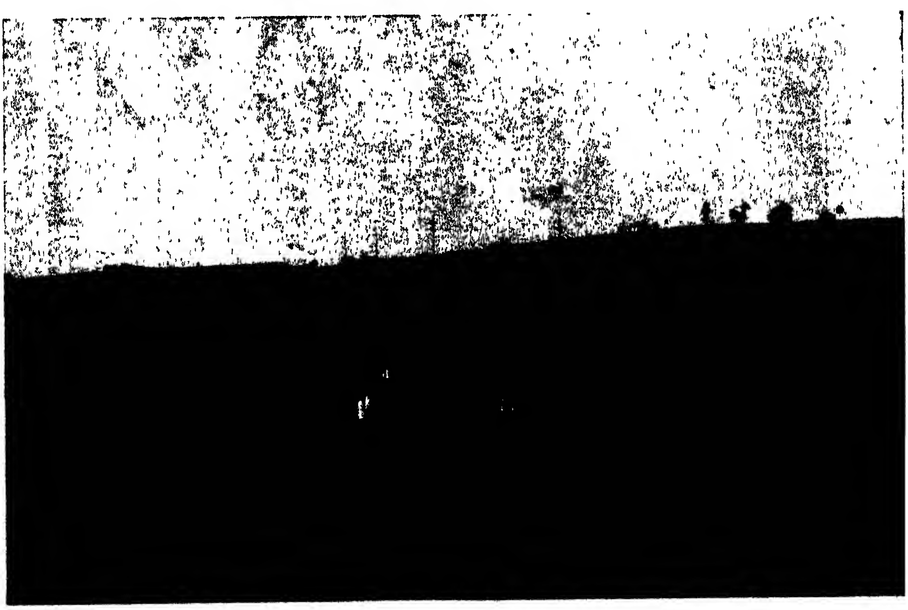


PLATE 50.

ROSEWOOD SHIRE.—BRISBANE-TOOWOOMBA ROAD (HOSPITAL HILL).

PLATE 51.
CLIFTON SHIRE.—CLIFTON-PITTSWORTH ROAD.
Cement penetration.

PLATE 52.
LIVINGSTONE SHIRE.—FARNBOROUGH-BYFIELD ROAD.
Constructed June, 1934.

PLATE 53.
COMPLETED METALLED SECTION READY FOR TRIMMING AND BITUMEN SURFACE—NORTHERN HIGHWAY (REDCLIFFE-CABOOLTURE SECTION).

PLATE 54.
NORTH COAST ROAD (REDCLIFFE-CABOOLTURE SECTION).
Finished pavement.

PLATE 55.
CAMBOOYA SHIRE.—GREENMOUNT-HIRSTVALE ROAD, LOOKING TOWARDS TOOWOOMBA.

PLATE 56.
PIONEER SHIRE.—MACKAY-HABANA ROAD.
Flood invert section on road serving cane-growing and dairying district north-west of Mackay.

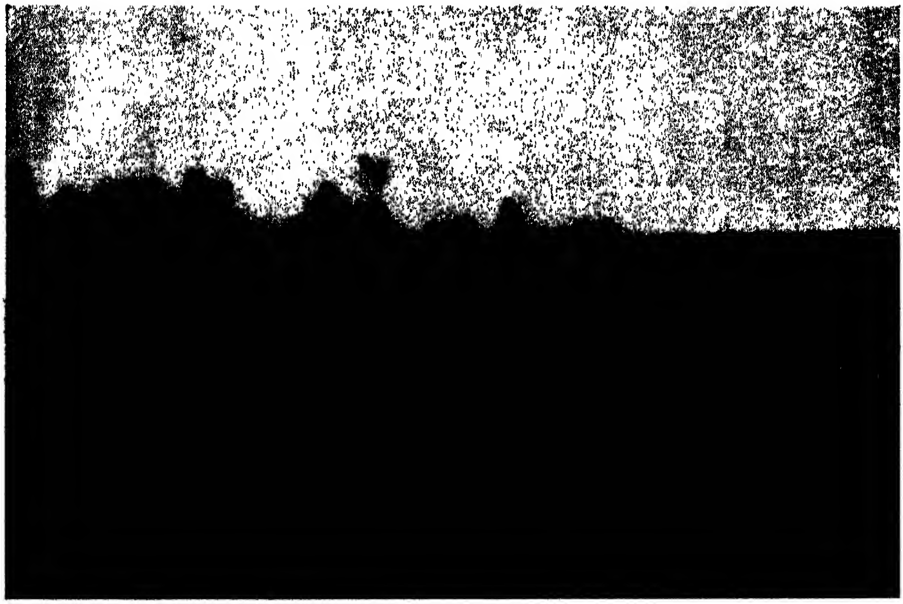


PLATE 57.
ROSELLA-HOMEBUSH ROAD.
Serving cane-growing area.

PLATE 58.
DOUGLAS SHIRE.—CAIRNS-PORT DOUGLAS ROAD.

PLATE 59.
PACIFIC HIGHWAY (MAIN SOUTH COAST ROAD).
Night visibility discs on curves.

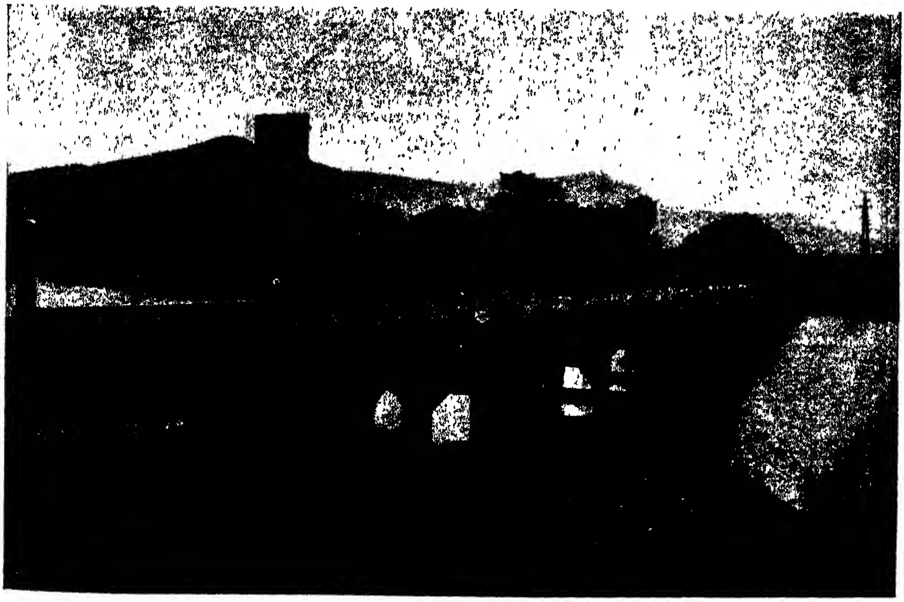


PLATE 60.
CAIRNS-PORT DOUGLAS ROAD.—STRATFORD BRIDGE OVER THE BARRON RIVER.

PLATE 61.
MIRANI SHIRE.—MARIAN-NETHERDALE ROAD-CATTLE CREEK BRIDGE EXTENSION.
Extension to existing bridge erected by Shire Council. The maintenance of the approaches was a constant source of expense to the Council.

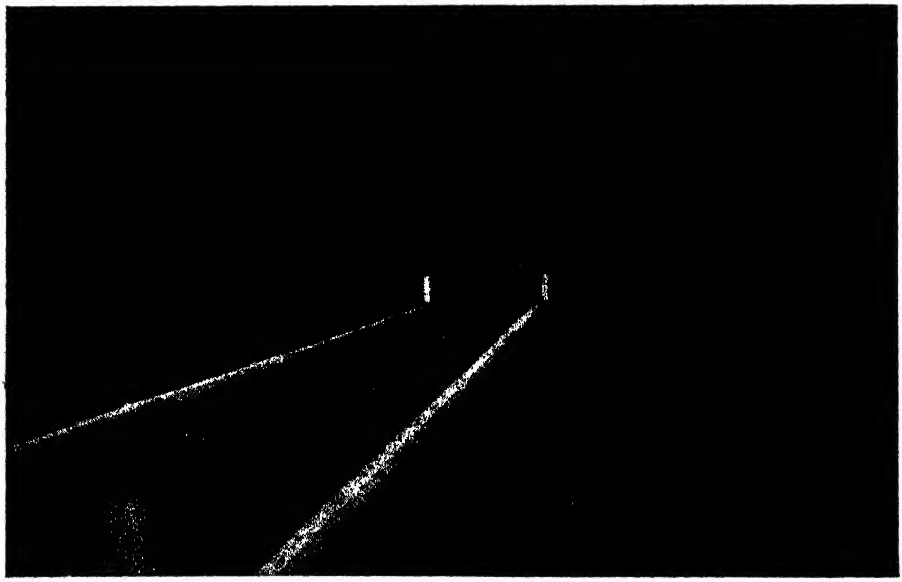


PLATE 62.
MAROOCHY SHIRE.—MARY RIVER ROAD.
Bridge over Little Yabba Creek.

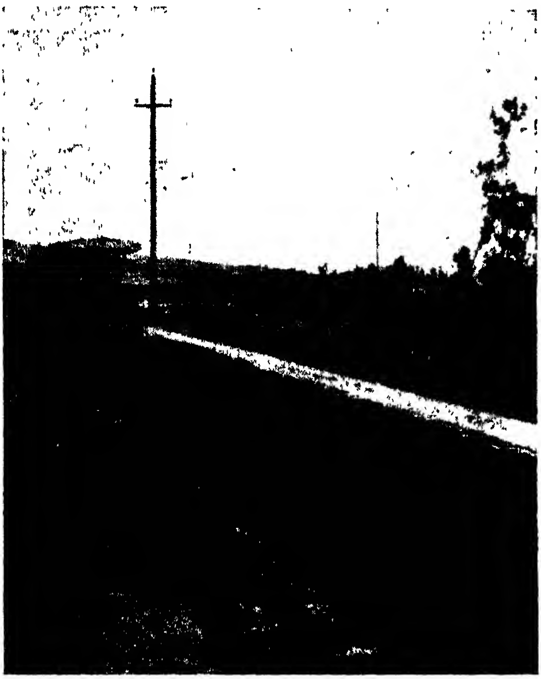


PLATE 63.
BRISBANE-TOOWOOMBA ROAD.
Rolling and smoothing after drag operations.

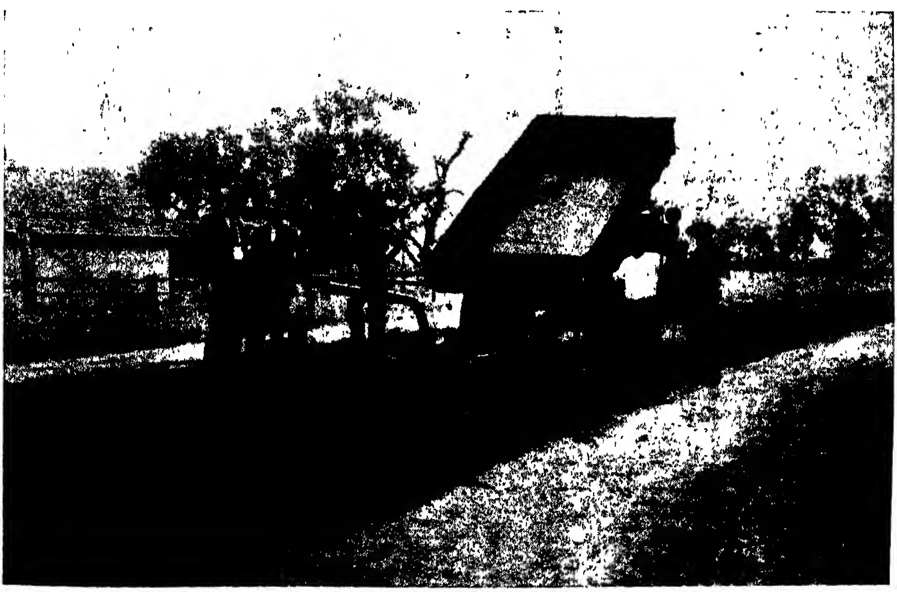


PLATE 64.
DRAG SPREADING (WITH 8 FEET DRAG) ON BRISBANE-TOOWOOMBA ROAD.
Spreading operation completed.

PLATE 65.
CRUSHING AND MIXING OPERATIONS ON BRISBANE-TOOWOOMBA ROAD.

PLATE 66.
SPRAYING TAR ON THE BUNDABERG-GIN GIN ROAD.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from 3rd January, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for January, February, and March, 1935:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 15th January, 1935—"The Place of Plant Breeding in Agriculture," by Dr. L. G. Miles, Plant Breeder.

Thursday, 17th January, 1935—"The Trend of Agricultural Economics," by Hon. Frank W. Bulcock, M.L.A., Secretary for Agriculture and Stock.

Tuesday, 22nd January, 1935—"The Problem of Youth—The Call of the Land," by J. F. F. Reid, Editor of Publications.

Thursday, 24th January, 1935—"A New Deal for the Farmer," by J. F. F. Reid, Editor of Publications.

Tuesday, 29th January, 1935—"Frost Prevention by Orchard Heating," by H. Barnes, Director of Fruit Culture.

Thursday, 31st January, 1935—"Wheat in Queensland," by H. W. Ball, Assistant Experimentalist.

Tuesday, 5th February, 1935—"The Rural Revival in Britain—What it Means to the Australian Producer," by J. F. F. Reid, Editor of Publications.

Thursday, 7th February, 1935—"Grading Cotton," by R. W. Peters, Cotton Experimentalist.

Tuesday, 12th February, 1935—"Winter Legumes and other Fodders," by C. T. White, Government Botanist.

Thursday, 14th February, 1935—"Some Notes on Our Inland Pastures," by S. L. Everist.

Tuesday, 19th February, 1935—"Management of Paspalum Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 21st February, 1935—"The Cultivation of Lucerne," by A. E. Gibson, Director of Agriculture.

Tuesday, 26th February, 1935—"The Effects of Fertilizers on the Quality of Tobacco Leaf," by W. J. Cartmill, B.Sc.

Thursday, 28th February, 1935—"Snapping Cotton," by R. W. Peters, Cotton Experimentalist.

Tuesday, 5th March, 1935—"The Activities of Sheep and Wool Branch with Special Mention of the Farmers' Wool Scheme," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 7th March, 1935—"Sheep Licks," by J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 12th March, 1935—"Winter Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 14th March, 1935—"Grape Culture," by H. Barnes, Director of Fruit Culture.

Tuesday, 19th March, 1935—"Some Remarks on Animal Nutrition," Part I., by E. H. Gurney, Agricultural Chemist.

Thursday, 21st March, 1935—"Some Remarks on Animal Nutrition," Part II., by E. H. Gurney, Agricultural Chemist.

Tuesday, 26th March, 1935—"Observations on Tobacco Fertilizer Trials," by W. J. Cartmill, B.Sc.

Thursday, 28th March, 1935—"Expanding our Export Trade," by J. F. F. Reid, Editor of Publications.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register for the Herd Book of the Australian Illawarra Shorthorn Society, Jersey Cattle Society, Friesian Cattle Society, Guernsey Cattle Society, production charts for which were compiled for the month of November, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.			
Handsome 6th of Oakvilla	T. Strain, Wondai	11,495·35	465·605	Victory of Greyleigh
Empress 13th of Sunnyside	P. Moore, Wooroolin	10,400·14	426·074	Emblem of Sunnyside
	SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.			
Clonogan Mignonette	T. Strain, Wondai	10,046 41	380·483	Jerry of Cosy Camp
	SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.			
Marn Patty	R. Martin, Biggenden	9,743 15	464·798	Triumph of Happy Valley
	JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.			
Kalinga Roseleaf 2nd	J. A. Heading, Cloyna	7,361·81	305·576	Bruce Galvallis
Merridale Mermaid	H. D. Giles, Biggenden	6,423·05	290·022	Premier of Lanefield
	SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.			
Marn Betty	R. Martin, Biggenden	7,345·25	340·208	Happy Valley Happy Lad
Lyndith Queenie 5th	S. H. Teese, Veresdale	7,999·75	278·206	Brooklyn Terrace, President
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS) STANDARD 230 LB.			
Sunnyview Bess	J. Phillips, Wondai	13,017·16	507·425	Lovely's Commodore of Burradale
Montcairn Melba	A. E. Vohland, Aubigny	7,312 25	316·066	Viceroy of Wilga Vale
Blackland's Carnation	A. M. Johnson, Gracemere	6,909·4	264 074	Park View Limelight
Cedargrove Ita 11th	W. J. Freeman, Rosewood	6,034 5	257·670	Duke of Cedar Grove
Penrhos Beauty	A. Sandilands, Wildash	5,547·5	247·180	Rosenthal's Pendant's Prince
Mountain Home Gem 8th	M. C. Lester, Laidley Creek	6,253·01	239·876	Headlight of Greyleigh
Penrhos Plum 2nd	A. Sandilands, Wildash	5,920·5	234·712	Rosenthal Pendant's Prince

JERSEY.				
JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.				
Glenview Sunflower	F. P. Fowler & Sons, Biggenden	5,536·	327·064	Trinity Officer
Trecarne Merle IV.	D R. Hutton, Cunningham	5,425 75	300 173	Trecarne Golden King
Glenview Choice	F. P. Fowler & Sons, Biggenden	4,821·75	283·983	Trinity Officer
Glenview Lady Lynn	F. P. Fowler & Sons, Biggenden	4,449 5	282·212	Carlyle Larkspur 2nd Empire
Glenview Viscountess	F. P. Fowler & Sons, Biggenden	3,897 45	239·019	Carlyle Larkspur 2nd Empire
FRIESIAN.				
SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.				
Oakland Maria Pearl	W, Richters, Tingoora	9,382·32	332·143	Pied Rock
GUERNSEY.				
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Willow Brae Sequel	H. Blanck, Eudlo	4,867·8	276·785	Linwood Lone Star

Crown Land for Selection.

SHEEP COUNTRY.

BLACKALL DISTRICT.

LORNE AND TERRICK TERRICK RESUMPTIONS.

67,316 acres.

(To be open at the Land Office, Blackall, on Thursday, 7th February, 1935.)

Comprising portion 5, parish of Berriedale, situated about 30 miles south of Blackall, and portions 5, parish of Lauriston, and 2, parish of Maindample, situated about 25 miles south-west of Blackall.

The country comprises open and well-shaded downs, well grassed with Mitchell, blue, and Flinders grasses, and is watered by bores and tanks.

The land is good sheep country, suitable for woolgrowing, breeding, and fattening.

Annual rent is 4d. per acre for the first seven years; also

LONGREACH DISTRICT.

PORTLAND DOWNS RESUMPTION.

44,462 acres.

(To be open at the Land Office, Longreach, on Thursday, 21st February, 1935.)

Comprising portions 1, parish of Seaford, and 4, parish of Tylden, situated about 25 miles and 30 miles north-east from Isisford.

Portion 1, parish of Seaford, is watered by the Barcoo River and by a tank and bore drain, and portion 4, parish of Tylden, by creeks, dams, and a bore drain.

The country is partly open downs, timbered with gidyea and boree, and grassed with Mitchell, blue, Flinders, and other grasses.

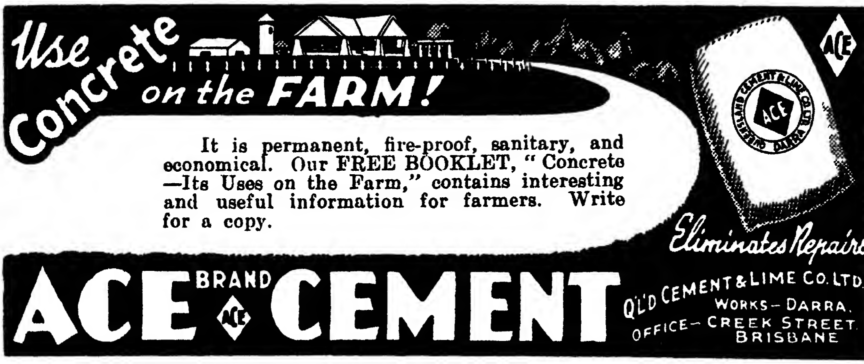
The land is good sheep country, suitable for woolgrowing, breeding, and fattening.

The annual rent for the first seven years is 3½d. per acre for portion 1, and 2¾d. per acre for portion 4.

Portion 4, parish of Tylden, will be subject to the condition that 2,500 acres shall be ringbarked within five years.

The term of lease in each case is twenty-eight years. During the first three years each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep, and must be enclosed with a rabbit and marsupial-proof fence.

Free lithographs and full particulars obtainable from the Land Agents, Blackall and Longreach, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence Bureaux, Sydney, and Melbourne.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Well and Sub-Artesian Bore Sites

The services of the Government Water Finder (Mr. J. H. Bestmann) are available to settlers in Queensland for the purpose of locating well or sub-artesian bore sites.

A fee of 10s. is charged for each site selected, together with a mileage rate of 1s. a mile (one way) from the nearest railway station to the site.

Applications should be addressed to the Secretary, Land Administration Board (Public Estate Improvement Section), Department of Public Lands, Brisbane.

Note.—The Water Finder will be sent to distant localities only if there are a sufficient number of applications from such localities to warrant the necessary expenditure.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

"Chinese Cabbage."

J.W. (Capella)—

The specimens have been determined as *Brassica juncea*, a common weed in cultivations. In some parts of the south coast of Queensland it is known locally as Chinese Cabbage. It probably has some nutritive value as a fodder, but in the case of milking cows it may possibly impart a disagreeable flavour to the milk.

Winter Sweet or "Bushman's Poison."

E.J. (Auchenflower)—

The specimen forwarded is *Acocanthera spectabilis*, better known to nurserymen as *Toxicophlœa spectabilis*, the Winter Sweet or Bushman's Poison. It is a native of South Africa, and much cultivated as an ornamental shrub. A list of poisonous plants in the Brisbane Gardens was published recently, and a friend in Melbourne said he noticed the list and was surprised to see *Acocanthera* in it. Mr. Cronin, the Director of the Melbourne Botanic Gardens, had informed him that both himself and his children had eaten the fruits of this tree quite freely without any ill-effects following. The plant, however, is undoubtedly a poisonous one. We have never heard of persons being actually poisoned in the way you mention through handling the leaves and flowers, although the flowers are commonly used by nurserymen particularly for making up wreaths, crosses, &c. We were very interested to have your note on the plant. As you know, with these irritant plant poisons some people are much more sensitive than others.

Tick Trefoil. Barbed Wire Grass. Pimpernel. Vicia Sativa.

W.C. (Buderim Mountain)—

1. *Desmodium triflorum*, a species of Tick Trefoil, quite a valuable legume in the pasture. It is eaten by stock, the only objection to it being that it grows rather too close to the ground to give animals much of a bite. The name Tick Trefoil refers to the small pods being broken off in small pieces, which adhere to clothing, to the hairs of animals, &c., by means of minute hooked hairs or bristles.
2. *Cymbopogon refractus*, Barbed Wire Grass. The local name is given on account of the peculiar way the spikelets bend back. Not of much value as a fodder.
3. *Anagallis arvensis*, Pimpernel, a common farm weed in Queensland. It is poisonous to stock but rarely eaten by them in sufficient quantities to cause trouble. Several years ago we received from your district seeds taken from the stomach of a cow supposed to have died from plant poisoning.
4. *Vicia sativa* var. *segetalis*, a variety of the common Vetch; quite a good fodder. It often comes up spontaneously in cultivation paddocks, along railway cuttings, roadsides, &c.

Brazilian Clover.

E.W. (Roma)—

Your specimen represents *Jacksonia brasiliensis*, commonly called Mexican or Brazilian Clover, although the plant does not belong to the clover family nor is it even closely related to the clovers and trefoils. Although it has been highly spoken of as a fodder at odd times, our experience with it in Queensland is that stock rarely take to it. Most of our experience with it is as a weed on coastal orchards where it is extremely abundant, particularly in some of the pineapple plantations on the North Coast Line. We do not think there is much to fear from it in the general pasture, as it is mostly a weed of cultivation or any place where the ground has been disturbed. It is possible that in the drier climate of the Maranoa district the plant might be more palatable, particularly in the stages when it is drying off somewhat. Very often cattle refuse this type of plant when it is green and luxuriant and eat it readily enough in the form of hay or when it is drying off naturally.

Red Leg or Bitter Blue Grass.

J.G. (Ridgelands)—

Your specimen represents the Red Leg or Bitter Blue Grass (*Bothriochloa decipiens*), a native grass very abundant in many localities. As the better grasses are eaten out this grass persists, and in some parts of coastal Queensland and in the Lockyer and Fassifern districts it becomes the dominating grass in the native pasture. So far as we have experienced stock do not take readily to it, and where possible it is advisable to try and introduce better grasses to smother it out.

Cape Cotton.

J.D.F. (Jimbour)—

The specimen is *Gomphocarpus fruiticosus*, the Cape Cotton, also called Wild Cotton or Balloon Cotton. It belongs to a poisonous family and we believe is poisonous to stock, but they rarely eat it in sufficient quantities to cause trouble. It is a native of South Africa but has been naturalised in Queensland and New South Wales for many years now. In this State it is most abundant on scrub coastal farms, but of recent years it seems to be spreading inland, particularly on cleared scrub country. If allowed to spread it certainly does smother country very rapidly and we have seen it on the coast as thick as Scotch Thistle; sometimes is on the Downs and in the Maranoa district.

Wandoan Plants Identified.

DON (Wandoan)—

1. *Rhagodia nutans* (?). Specimen very decomposed, therefore determination rather doubtful. It is, however, one of the Saltbush family and represents one of the green species either as determined or an allied one. They are quite good fodders, relished by stock particularly when made into hay or when drying off somewhat. The only disadvantage is that they are apt to taint the milk of dairy cows, giving it a weedy or almost fishy flavour.
2. *Zygophyllum apicu'atum*, Gall Weed or Twin leaf. I have never seen stock eat this plant, though it is not known definitely to contain any poisonous principles. It is exceedingly abundant in much of the ring-barked country on the Western Downs and parts of the Maranoa.
3. *Chenopodium album*, Fat Hen.
4. *Tetragonia expansa*, New Zealand Spinach. The young shoots and leaves of this plant are said to make quite a good spinach. We cannot say we have known stock take to it to any great extent. They prefer many of these succulent plants when they are drying off somewhat rather than when they are green and luxuriant.
5. This specimen is too decomposed for identification.
6. *Panicum queenslandicum*, a native Panic Grass. Most of the native Panic Grasses are quite good fodders.
7. *Eriochloa* sp. One of the so-called Early Spring Grasses. Excellent fodder and worth encouraging.
8. *Solanum aviculare*, Kangaroo Apple. A fairly common weed in parts of Queensland, both on the coast and for some little distance inland. The berries are poisonous. The young plants as they come up after a burn have been accused, and I think on good evidence, of poisoning sheep, though normally speaking stock avoid the plant.
9. *Cassia laevigata*, commonly called Arsenic Bush, though this name is rather misleading as the leaves when eaten are likely to purge stock but not to have any other effect. We think it would be just as well, if you only have a few bushes on your place, to destroy them.

Knot Grass or Knot Weed.

L. McG. (Bungeworgorai)—

Your specimen represents *Polygonum aviculare*, Knot Grass or Knot Weed, a plant widely spread as a weed of cultivation over the warm temperate regions of the world. It is quite a common plant on some of the farms of the Darling Downs. We have never heard of it causing harm to stock in any way, although it is possible that if the long wiry stems were eaten by them impaction would follow.

General Notes.

Staff Changes and Appointments.

Mr. R. W. Bambrick, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, has been transferred from Toowoomba to Hughenden.

Mr. G. B. Gallwey, Inspector of Accounts under the Dairy Produce Acts, Department of Agriculture and Stock, has been appointed also Inspector of Accounts under the Pig Industry Act.

The following additional appointments have been granted to Inspectors in the Department of Agriculture and Stock:—

Messrs. S. B. Myles, Stock Inspector, Wyalla; J. Wyvill, Stock Inspector, Nanango; A. F. H. D. Singh, Stock Inspector, Wondai; T. Douglas, Stock Inspector, Kingaroy; C. E. Ellis, Stock Inspector, Killarney; and R. T. Cridland, Slaughtering Inspector, Rockhampton; have been appointed also Inspectors under the Dairy Produce Acts.

Mr. M. D. O'Donnell, Dairy Inspector, Gympie, has been appointed also an Inspector under the Diseases in Stock Acts.

Mr. E. W. Ladewig, Dairy Inspector, Murgon, has been appointed also an Inspector under the Slaughtering and Diseases in Stock Acts.

Mr. J. V. Munck has been appointed Canegrowers' Representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. P. Kirwan, resigned.

The following have been appointed Honorary Rangers under the Animals and Birds Acts in the Clermont district:—Messrs. S. C. Fox, Manager of Batheaston Station; J. S. McCormack, Manager, Diamond Downs; K. McLean, Manager, Peak Downs; H. C. S. Griffin, Manager, Wolfang Station; H. A. Rickertt, Manager, Langton Downs; R. H. Griffin, Manager, Currajong Station; J. F. McKenzie, Manager, Moray Downs; R. O. Spenceley, Manager, Kilcummin Station; W. R. Tindale, Manager, Monteagle Station; H. K. Goodwin, Manager, Banchory Station; R. A. Mathieson, Manager, Logan Downs; and F. W. Kettle, Manager, Prairie Station.

Mr. C. R. Mulhearn, B.V.Sc., Veterinary Officer to the Division of Economic Entomology of the Council for Scientific and Industrial Research, Canberra, has been appointed a Government Veterinary Surgeon, Department of Agriculture and Stock, and will be attached to the staff of the Animal Health Station at Yeerongpilly.

The following transfers of officers of the Department of Agriculture and Stock have been approved:—

Mr. J. W. Winlaw, Stock, Slaughtering, and Dairy Inspector, from Brisbane to Boonah;

Mr. J. R. D. Munro, Dairy Inspector, from Warwick to Clifton; and

Mr. L. Moriarty, Dairy Inspector, from Clifton to Warwick.

Mr A. M. Taylor, Clerk of Petty Sessions, Ayr, has been appointed Chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards in lieu of Mr. T. R. Kennedy, Police Magistrate, Bowen.

Constable F. Mawn, of Mount Surprise, has been appointed also an Inspector of Slaughter-houses.

Mr. R. A. F. Ives, of Upper Mudgeeraba, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

The following have been appointed Honorary Inspectors under the Diseases in Plants Acts:—

Messrs. G. J. McGee (Eulama), D. C. Haylock (Cootharaba), A. Braithwaite (Chinaman's Creek), W. R. Hayter (Ironstone Creek), and J. H. Lane (Middle and Skyring's Creeks).

Pure Tobacco Seed Districts Declared.

A Tobacco Pure Seed district embracing Marmor and Bajool, near Rockhampton, was declared by Order in Council of the 20th September last. It has since been recommended that an additional area be included, and an Order in Council under the Tobacco Industry Protection Act has been issued altering the boundaries of this district. The Archer district is now included.

Rural Topics.

Castration of Pigs.

There is no more important work associated with the raising and marketing of pork and bacon pigs than that of having animals of the right type in the primest of condition at the time they go forward to the factory or saleyard. With the knowledge that this simple surgical practice is essential in preparing male pigs for the meat market, and with the further knowledge gained from experience and observation that many beginners as well as many older farmers do not know how to perform correctly the operation of castration, the Senior Instructor in Pig Raising, Mr. E. J. Shelton, has dealt fully with the subject-matter and has presented detailed instructions in convenient form and in every-day language in a Departmental Pamphlet, "Castration of Pigs," now obtainable free of cost on application to the Department of Agriculture and Stock, Brisbane.

Summer Comfort for Pigs.

During the summer months the provision of shade for pigs is very essential. The ordinary sty, especially if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If no trees are present a wooden shed will answer the purpose.

Another important aid to the health and comfort of swine is the provision of a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pig-yards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area. Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard it is to be found in just this place.

Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished.

Waster—Or High Producer? Only the Tester can Tell.

All experience goes to show that it is futile to speak of the productive ability of a dairy cow except as proven by her test. When herd-recording was commenced it was contended by many farmers that they could tell what their cows were doing without putting them under record, merely by relying on outward appearances, such as body formation, the size of the milk veins, and size and shape of the escutcheon. There were those who knew the quality of milk by its colour, and others who could tell by its feel. The systems of judging were many and diverse. To settle the matter definitely for them it was arranged that when the recorders went their first rounds, members were to pick out on their own judgment the three best and three worst cows in their herds, and at the conclusion of the year's testing their selections were to be compared with the actual returns obtained as shown by the Babcock test.

Each member put his pick down on paper and handed it over to the tester. The results convinced all concerned that they were wrong in their contentions; the Babcock won all along the line. In not one case was an owner able to pick out without error his worst and best cows.

The majority were right out in their reckoning. In some cases those picked out as the worst proved to be among the highest yielders. One farmer thought so much of a cow that he had paid a fancy price for her and brought her at considerable expense some 200 miles to his farm on the Tweed. He thought her the best cow on that river, and certainly by appearance she was a top-notcher. She was first recorded six weeks after calving and gave one half-pound of butter for the twenty-four hours' milkings, the test being 1.9 per cent. fat. She was in good health and condition and feed was plentiful. The following month she just exceeded a quarter of a pound of butter for the day. The third month's test showed the day's butter production to be under a quarter of a pound. She gave a fair quantity of milk, but there was too little fat in it. She was soon culled out.—A. and P. Notes, N.S.W. Department of Agriculture.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

HOLIDAY TRAVELLING.

TRAVELLING with a baby and several small children is no holiday for their mother. Unless she plans everything carefully beforehand a long train journey may end with an exhausted mother and a handful of cross, tired, over-fed children, who will be sick for the next few days. Perhaps a little advice at this season of the year may be helpful.

Food.

It is most important that this should be carefully considered beforehand. The breast-fed baby, who has been properly managed, should give no trouble at all. But it is not so with the bottle-fed infant. We have seen many who have been seriously upset by milk which has gone bad in the train, especially in hot weather. It is true that there are ways of carrying the baby's milk safely; but these require so much care and understanding, and the consequences of any mistake may be so serious, that we cannot advise them. Nor can we advise the mother on a journey to buy milk at the railway stations. Much the safest plan is to carry a supply of good dried milk (Glaxo or Lactogen), not, of course, dried skimmed milk. Boiling water is always procurable, and it may also be carried in vacuum flasks, so that it is always possible to scald the bottles and teats and to make up the feeds for each meal. Any milk left after a feed should be thrown out at once, never left in the bottle. It is well to carry more than one bottle and teat. These should be wrapped in clean, boiled, butter muslin and carefully packed in a tin. Though the baby may not be used to dried milk, it will do him no harm, provided it is not made too strong. It will be wise to make it up rather weaker than advised on the tin. At the end of the journey, when good fresh milk is procurable, he will soon make up for having been on a rather weak mixture for one or two days.

For the toddler avoid bought foods, cakes, and sweets, which may do him much harm, especially as the novelty and excitement will very probably have weakened his digestion. Remember that a day of rather short rations will do him no harm, but a day of over-feeding may go a long way to spoil his holiday and your own, too. Carry your own provisions. Pack a tin with some slices of baked bread and oatcake, which may be ready buttered, and some sandwiches, preferably of brown bread. These may contain lettuce or silver beet, sliced tomatoes, egg (either sliced or scrambled), or soft cheese spread on butter, or marmite. Add a few dates and raisins, apples, and oranges, and you have all the solid food necessary. He may drink dried milk dissolved in hot water, like his baby brother, or you may carry one or two lemons with a small packet of sugar, which will make a drink he will surely relish. Let him have his little picnics at the right times, but don't try to keep him

quiet by feeding him all the time. You won't succeed; it will only make him cross and irritable, miserable himself and a torment to others; but let him have a drink of water when he wants it.

Amusement.

Most children will be interested in looking out of the window until they are tired, but don't let them tumble out. It may be well to carry a few simple toys and picture-books and writing-pad and a pencil.

Clothing.

You won't need to carry much wraps in the summer, but a light rug and cushion will be useful. For the baby have a plentiful supply of napkins, and some old newspapers or a mackintosh bag for the wet napkins.

Rest and Sleep.

These are important if over-fatigue and fretfulness are to be avoided. A dress-basket is most useful for a young baby. Properly managed he will sleep or lie awake in this quite contented, and much happier than if constantly nursed in the arms of an over-heated and exhausted mother.

If you have trained your children well you will reap your reward when travelling. How sad it is to see children in the train scrambling over everything, eating an endless supply of cakes and sweets, grubby and tired, ignoring their mother's efforts at control, and finally fretful and crying from sheer exhaustion and discomfort.

IN THE FARM KITCHEN.

The Orange—Food and Medicine.

"The apple is a most delightful fruit," said Professor V. H. Mottram, Professor of Physiology of the University of London, and an authority on foods, "yet it is only a sweetmeat and is negligible as nourishment or as a medicine. On the other hand, the orange is most valuable as nourishment, and medicinally. It is anti-scorbutic, and rich in the vitamin contained in sunlight. It also has calcium, which is essential to bone-building. Recent experiments indicate that oranges are nearly the equal of milk in nourishment."

Food Value of Bananas.

When it is considered that the banana is an article of diet in every country of the world, and that the inhabitants of some portions of the globe subsist on it almost entirely, it is strange to find some people under the impression that bananas should be eaten sparingly and only by people with good digestion, runs the introduction to the banana recipe booklet issued by the Commonwealth Banana Committee.

It is true that the banana, eaten in an *unripe* state, will, in common with all fruits, cause intestinal disturbance to a greater or less degree. The *ripe banana*, however, is not only a fruit of remarkably high food value, but is amazingly easy to digest. It can be eaten with safety and relish by everyone from infancy onwards.

No fruit compares with the ripe banana in food values; no fruit approaches it in regard to digestibility and easy assimilation; no fruit and very few foodstuffs approach it in regard to value for money expended. Writing of the banana, Professor S. C. Prescott (Massachusetts Institute of Technology) says: "The ripe banana contains all the classes of food materials required for the human body. Although the amounts of protein and fat are slightly too low to constitute a perfectly balanced ration, the combination of bananas with milk, or its utilisation to supplement a diet containing a small amount of meat will produce a ration which is ample to take care of the body needs."

Summer Salads.

Tomatoes with chopped parsley and young onions.

Tomatoes (small) peeled and quartered, with diced cucumber, pieces of cheese, hearts of lettuce, moulded spinach, diced beetroot, and sliced egg.

Asparagus tips, chopped tomato, and broken cauliflower.

Diced beetroot with watercress, shredded cabbage or lettuce, cauliflower separated into flowerets with quartered hard-boiled eggs.

Diced cold boiled potatoes, finely-chopped onion, chopped celery, salt.

Cucumbers cut lengthwise and steamed until tender. Scoop out the seeds and fill with prawns or lobster mixed with mayonnaise. Serve these cucumber boats on lettuce. Decorate with whole prawns and sliced olives.

Red Heart Salad.—Set tomato jelly in a shallow pan and cut with a heart-shaped pastry cutter, arrange with hearts of lettuce.

Artichokes cooked and quartered served with thinly sliced oranges and chopped celery.

Stuffed Beets.—Scoop out the centre and fill with chopped cucumber, radishes, celery, and olives mixed with dressing.

Stuffed Tomatoes.—Scoop out the centre and fill with chopped tomato pulp, diced cucumber, salt, pepper, a little grated horse-radish and dressing, or chopped tomato, celery, raisins or sultanas, a very little green onion, a finely chopped sour apple, and dressing.

Chopped tomato, cucumber, cooked sweet bread (any white meat may be used instead), salt, pepper, capers, with dressing.

A Way of Serving Tomatoes.—Cut in halves and put together again with a layer of cream cheese, seasoned and moistened with salad dressing. Top with a sprig of parsley.

Banana, beetroot, cucumber, grated nut, and lettuce.

Orange, tomato, beetroot in mayonnaise jelly; serve on lettuce.

Pineapple, tomato, cheese in mayonnaise jelly; serve on lettuce.

Apple, celery, parsley, walnut, on lettuce.

Beetroot and green peas in mint jelly.

Combination Salad.—Tomato wedges, sliced cucumber, onion rings; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

Green Vegetable Salad.—Cooked string beans and peas, diced cucumber, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with French dressing.

Chiffonade Salad.—Cubes of cooked beetroot, sliced hard-boiled eggs, minced onion; sprinkle with vinegar and let stand for some hours; serve on lettuce with mayonnaise.

Carrot and Cabbage Slaw.—New carrots, cut in long fine strips; cabbage finely shredded mixed with vinegar; combine carrots and cabbage by tossing together lightly with salad dressing; serve thoroughly chilled.

Golden Glow Salad.—Diced pineapple, grated raw carrot, grated nut; on lettuce with mayonnaise.

Other Salads.—Macaroni salmon, sliced egg and minced onion; served on lettuce.

Baked apples, served with nuts and raisins on lettuce, garnished with currant jelly and mayonnaise.

Grapefruit and orange sections arranged on lettuce with fine strips of dates and figs; dressing.

Celery, cheese, and pineapple on lettuce; serve with dressing.

Pears and Asparagus Salad.—Half a pear for each serving; four or five asparagus tips, salt and pepper, and dressing; serve on lettuce.

Jellied Mayonnaise.—Any salad vegetables may be set in mayonnaise jelly, the recipe for which is as follows:—

Ingredients.

3 teaspoons gelatine.
3 tablespoons condensed milk.
2 dessertspoons vinegar.
1 egg (hard-boiled).
¼ teaspoon mustard.
1 teaspoon sugar.
½ teaspoon salt.
½ cup hot water.

Method.

Crush yolk of egg and sugar together in a basin, add mustard, salt, pepper, vinegar, and milk. Mix all thoroughly together. Dissolve gelantine in hot water, add to other liquid and blend. Pour on to prepared salad ingredients.

Poison in Paint—Danger to Children.

Lead-poisoning is by far the most common cause of the frequency of nephritis in Queensland, in the opinion of Dr. L. J. Jarvis Nye, of Brisbane, who, in his book "Chronic Nephritis and Lead-poisoning," urges the complete prohibition by law of the use of lead paint.

Dr. Nye gives figures to show that the increased death rate from chronic nephritis among young people in Queensland is a tragic reality, presenting an important field for research. Since 1928 he has been able to produce evidence that lead-poisoning in childhood has played an important part in causing the increased mortality.

"Of 87 patients questioned by me 71 said the paint on the verandas of houses occupied by them in their childhood was dry and powdery," he writes. "Forty-six were nail-biters or thumb-suckers, and in seven cases the parents said the child had been in the habit of licking raindrops from the veranda railings. Obviously the majority had been exposed to the risk of lead-poisoning."

Dr. Nye finds no support for suggestions that the frequency of nephritis in Queensland is traceable in any considerable degree to chronic tonsilar infection, syphilis, measles, diphtheria, malaria, or filaria, or to climatic conditions.

Investigating the possible sources of lead-poisoning, he dismisses the theory that the town water supply might be responsible to some extent, and comes to the conclusion that the most likely source is the paint on the walls of the houses and on the railings of the verandas. He attributes the lessening of the incidence of plumbism in Queensland to the education of the public on the subject, the legislative prohibition of the use of lead paint on veranda railings, the earlier recognition and treatment of cases by medical men, improved hygiene in the home and at school, the work of the Creche and Kindergarten Society, a change in the type of houses, and the introduction of an enormous number of non-poisoning paints.

Orchard Notes for February.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkept, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in

which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well-filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded, and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Furthermore, growers in the Stanthorpe district are reminded that luring the adult flies constitutes an important part of the present fruit fly campaign.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.,	No. of Years' Records.	Nov., 1934.	Nov., 1933.
North Coast.	In.		In.	In.
Atherton	2·28	33	8·42	5·14
Cairns	3·95	52	5·12	14·04
Cardwell	4·12	62	8·46	11·48
Cooktown	2·56	58	3·38	2·45
Herberton	2·56	48	6·26	6·01
Ingham	3·90	42	5·81	13·81
Innisfail	6·39	53	4·92	23·65
Mossman Mill ..	4·32	21	5·48	9·50
Townsville	1·89	63	3·06	5·86
Central Coast.				
Ayr	1·70	47	6·70	5·02
Bowen	1·29	63	2·13	3·57
Charters Towers ..	1·47	52	1·23	2·92
Mackay	3·15	63	3·38	13·65
Proserpine	2·92	31	6·05	10·81
St. Lawrence ..	2·36	63	8·86	7·89
South Coast.				
Biggenden	2·81	35	5·76	5·80
Bundaberg	2·53	51	13·93	6·66
Brisbane	3·81	83	5·68	8·41
Caboolture	3·49	47	8·25	8·30
Childers	2·79	39	5·78	7·82
Crohamhurst ..	4·34	40	7·97	11·89
Esk	3 28	47	4·05	7·44
Gayndah	2·95	63	7·32	6·38
Gympie	3·24	64	7·73	9·77
Kilkivan	2·58	55	5·04	4·50
Maryborough ..	3·22	63	5·77	8·84
Nambour	4·05	38	7·42	14·87
Nanango	2·71	52	7·50	6·87
Rockhampton ..	2·39	63	7·02	5·14
Woodford	3·25	47	7·29	7·13
Central Highlands.	In.		In.	In.
Clermont	2·07	63	2·20	7 60
Gindie	2 08	35	..	3 99
Springsure ..	2·17	65	6·17	6·72
Darling Downs.				
Dalby	2·78	64	5·46	7·16
Emu Vale ..	2·78	38	2·55	6·19
Hermitage ..	2·75	28	..	5·29
Jimbour	2·54	46	7·11	7·84
Miles	2·63	49	4·86	9·05
Stanthorpe	2·77	61	2·52	5·41
Toowoomba ..	3·37	62	3·65	8·45
Warwick	2·67	69	2·25	5·45
Maranoa.				
Roma	2·13	60	7·40	3·29
State Farms, &c.				
Bungeworgorai ..	2·24	20	8·39	4·24
Gatton College ..	3·03	35	2·83	11·15
Kairi	2·29	20	..	4·88
Mackay Sugar Experiment Station	2 89	37	3 81	11 82

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—NOVEMBER, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·85	87	70	91	18	61	3	338	10
Herberton	..	83	63	89	15,16,17	56	23	626	12
Rockhampton	29·9 3	86	68	93	10	61	1	702	13
Brisbane	30·00	79	64	88	14	58	4	568	12
Darling Downs.									
Dalby	29·95	82	60	89	7, 26	52	3	546	12
Stanthorpe	..	74	52	83	26	39	18	252	12
Toowoomba	..	76	57	85	11	49	18	365	13
Mid-Interior.									
Georgetown	29·86	98	71	103	17	61	23	474	7
Longreach	29·85	97	69	108	26	58	11	60	2
Mitchell	29·92	86	60	94	5	50	10, 11	525	11
Western.									
Burketown	29·84	97	77	105	16, 29	71	2, 24	15	1
Boulia	29·85	96	71	107	28	58	12	..	..
Thargomindah	29·87	89	67	107	29	55	10	121	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1935.		February. 1935.		MOONRISE. Jan., 1935.	MOONRISE. Feb., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·0	6·50	5·25	6·46	12·50	2·10
2	5·1	6·50	5·26	6 45	1·31	3·16
3	5·1	6·50	5·27	6·45	2·26	4 26
4	5·2	6·51	5·27	6·44	3·28	5·41
5	5·2	6·51	5·28	6·43	4·35	6·46
6	5·8	6·51	5·29	6·43	5·41	7·56
7	5·3	6·51	5·30	6·42	6·52	9·1
8	5·4	6·52	5·30	6·42	8·3	10·7
9	5·4	6·52	5·31	6·41	9·6	11·8
10	5·5	6·52	5 32	6·40	10·13	12·13
						p.m.
11	5·6	6·52	5·33	6·39	11·15	1·12
					p.m.	
12	5·7	6·52	5·33	6·39	12·17	2·9
13	5·8	6·52	5·34	6·38	1·18	3·8
14	5·9	6·51	5·35	6·37	2·20	3·52
15	5·10	6·51	5·36	6·36	3·18	4·36
16	5·10	6·51	5·36	6·36	4·14	5·14
17	5·11	6·51	5·37	6·35	5·5	5·46
18	5·12	6·51	5·38	6·34	5·54	6 18
19	5·13	6·51	5·39	6·34	6·37	6·48
20	5·14	6 50	5·39	6·33	7·14	7·17
21	5·15	6·50	5·40	6·33	7·47	7·45
22	5·16	6·50	5·41	6·32	8·18	8·13
23	5·17	6·50	5·42	6·31	8·44	8·48
24	5·18	6·50	5·42	6·30	9·13	9·24
25	5·18	6·49	5·43	6·29	9·42	10·6
26	5·19	6·49	5·43	6·28	10·13	10·56
27	5·20	6·48	5·44	6·27	10·46	11·53
28	5·21	6·48	5·44	6·26	11·26	..
29	5·22	6·47			a.m.	
30	5·23	6·47			12·12	
31	5·24	6·46			1·6	

Phases of the Moon, Occultations, &c.

5 Jan.	● New Moon	3 20 p.m	
12 ,,	☾ First Quarter	6 55 a.m.	
20 ,,	○ Full Moon	1 44 a.m.	
28 ,,	☽ Last Quarter	5 59 a.m.	

Perigee, 6th January, at 9.42 p.m.
Apogee, 22nd January, at 8.0 a.m.

Orion comes into view about an hour after sunset on the 1st and rises 4 minutes earlier each evening. The Great Square of Pegasus, being 6 hours earlier, will be on the Meridian at the times mentioned. The Scorpion dissapears over the western horizon almost as Orion comes over the eastern.

On the 2nd the Earth will arrive at that part of its orbit which is nearest the Sun, which will then be at a distance of 91,330,000 miles, but it will not be so near our zenith at midday as on 23rd December by nearly one-half a degree.

The occultation of Antares by the Moon will take place about 5 a.m. on the 3rd if the observer is north of parallel 20 in Queensland. An interesting spectacle will be afforded for those further south, where the star may be seen to skirt the edge of the Moon much in the same way that it did on 15th September last, when (after the voting was over) a very interesting sight was afforded by the Moon and the same star.

A very slight partial eclipse of the Sun will occur on the 5th far south in the western hemisphere near the Antarctic circle. So slight will the eclipse be that only one-thousandth of the Sun's face will be obscured by the Moon. In Queensland no part of it will be obscured; in fact, the Moon will pass about 1 degree from the Sun on its southern side. As a corollary to this eclipse, a fortnight later, on the 19th, when the Moon is full, it will become eclipsed in the shadow of the Earth. Commencing, technically, at 10.38 p.m., it will not be till 11.53 that the Moon will reach the darker part of the Earth's shadow and become noticeable. One hour three minutes later it will be totally immersed, and according to the state of the Earth's atmosphere near the eastern or western horizon, it will become more or less lost to view. It frequently happens that bent rays of sunlight reach the Moon in sufficient quantity to make it clearly visible all through what is called a total eclipse. Rarely does a black eclipse occur when the Moon can hardly be seen.

On the 8th, about midday, Saturn, with the Moon about 4 degrees from it, may be seen in a north-easterly direction by observers having a telescope or binoculars.

4 Feb.,	● New Moon	2 27 a.m.	
10 ,,	☾ First Quarter	7 25 p.m.	
18 ,,	○ Full Moon	9 17 a.m.	
26 ,,	☽ Last Quarter	8 14 p.m.	

Perigee, 4th February, at 9.24 a.m.
Apogee, 18th February, at 9.12 p.m.

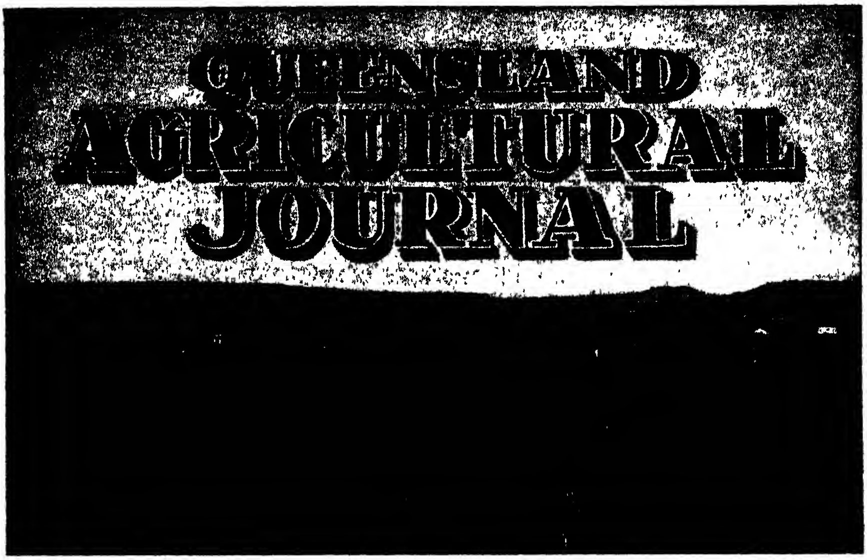
For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.



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Event and Comment.

Fruit for Distant Country Dwellers.

UNDER a scheme which has been approved by the State Cabinet, fresh fruit and vegetables will be delivered to people in the distant parts of the State by the Committee of Direction of Fruit Marketing at a quoted price, and the freight will be only 1s. a half-bushel case, with a reduction for larger quantities, no matter how far the fruit and vegetables have to be carried. Thus the bogey of lack of vitamins through difficulty in obtaining a regular supply of fresh fruit and vegetables will be swept away. All one has to do, under the new scheme, is to place an order, together with payment, with the nearest station-master or official, in charge of a station, who will be able to quote a standard price for what is required.

The Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said, in the course of a recent announcement, that towards the end of last year Mr. H. S. Hunter, an officer of the markets branch of the Department, had been detailed to make a special investigation into the possibilities of instituting a scheme for the distribution of fresh fruits, more particularly to the northern and western areas of the State.

Mr. Hunter discussed matters with the Committee of Direction of Fruit Marketing, and with officers of the Railway Department, and finally a scheme, involving the co-operation of all three organisations, was evolved, which had now received the approval of the Cabinet.

Reduced Freight.

The scheme, Mr. Bulcock continued, provided substantially that a minimum freight charge of 1s. a half-bushel case of fruit would be made, and with larger orders the freight would become correspondingly less. This price would include freight and service by the Railway Department and by the Committee of Direction, under the guidance and jurisdiction of the markets branch of the Department of Agriculture.

The actual scheme would operate by persons desiring to obtain fruit placing an order with the local station-master or officer in charge of wayside stations. The order must be accompanied by cash, and would be transmitted to Brisbane for execution by the Committee of Direction. A standard price list would be furnished, and the fruit would be forwarded in the most expeditious manner possible.

This scheme offered an opportunity to people in all parts of the State to obtain cheap fruit, merely by placing an order with the local railway official. The transport cost of a half-bushel case of fruit, including sales service, to Charleville, Cunnamulla, Quilpie, Biloela, Barcaldine, Longreach, Winton, Mackay, Proserpine, Townsville, Hughenden, Cairns, Atherton, Mount Isa, and intermediate stations covered by the scheme would be at a flat rate of 1s., involving in the case of Atherton railway transit equal to 1,309 miles, and in the case of Mount Isa 1,619 miles.

The scheme would operate at all railway stations west of Toowoomba, west of Warwick, from and including Gayndah to Monto, from and including Beecher to Monto and stations north and west of Rockhampton.

Quotations for the various fruits in season would be displayed from time to time on the notice boards at these railway stations, showing the prices at which the different kinds of fruit would be delivered.

Mr. Bulcock added that the scheme would embrace also the distribution of green vegetables, quotations for which would be displayed at railway stations, as in the case of fruit. All public and semi-public organisations in country districts were being invited to co-operate in the scheme.

The initial response to the scheme has been most gratifying. Numerous orders are coming to hand, many of which are from consumers served by the most distant stations on the far Northern and Western railway systems. There are indications that the residents of outback areas are co-operating to the fullest extent in the interests of the public health of those places. From information to hand, it is understood that private carriers are responding to the invitation of local bodies to convey from the railway to the inland consumer, at special rates, consignments despatched under the scheme.

The special half-bushel pack of assorted vegetables is proving most popular. It provides variety at a moderate cost, with a minimum of

waste. The adoption of the half-bushel case as the basis of the scheme has been done to meet the requirements of the average household. Even such fruits as bananas and pineapples are being put up in special half-bushel packs. If the scheme should provide a means whereby more fruit and vegetables can be consumed in country districts, advantage must accrue also to the growers in these times of glutted markets.

The Scheme Commended.

"It will be a very great godsend to everyone out in those districts," was the comment of a Brisbane doctor who has had considerable experience in the West. He said that of course everyone with the means was able to get fruit in the West, but the scheme certainly had big advantages for the poorer people. There was difficulty in getting fresh vegetables out there, and they were a big item, especially in times of drought, when the Chinese market gardens failed.

Medical research has taught the world a lot concerning diet in the last twenty years. It has shown that people may be fed abundantly with heating and energising foods, and yet may be ill-fed because they may not be receiving certain elements essential for the promotion of growth and the maintenance of the body's defences against various infections, and that this deficiency in their diet, which could scarcely be measured, may show itself in very grave diseases. Dr. E. Hirschfeld some time ago, in an address before the Royal Society of Queensland, succeeded in directing general public attention to the fact that these discoveries concern the welfare of Queenslanders very closely, and particularly those who are maintaining our greatest rural industry in the pastoral areas of the far West. To defective diet, and especially to the lack of fruit and vegetables, Dr. Hirschfeld ascribed the prevalence of Barcoo rot in the West and anæmia and lowered vitality among children. He also suggested that the incidence of ophthalmia might be much reduced by giving children more foods that supply vitamin A. Milk, cream, and butter are rich in this important vitamin; consequently, people living in our towns and dairying districts rarely suffer a lack of it. Drought in western districts, however, means that nearly everyone, including mothers and children, must go short of vitamin A so long as they depend for it on milk and cream and butter; but from fruit and many vegetables they could obtain this element on which the body relies for the maintenance of health. Dr. Hirschfeld's views are supported by many medical authorities, including Dr. Harvey Sutton, who has remarked on the western retreat of ophthalmia in New South Wales before the advance of settlement, and by Dr. A. Jefferis Turner, Director of the State Department of Infant and Child Welfare, who has been disseminating as widely as possible instruction concerning the vitamin values of foods.

In a subsequent address to Parliamentary representatives of western constituencies, Dr. Hirschfeld urged that the people of the West should be educated in the use of such vitamin-laden foods as fresh, green vegetables, fresh fruits, tomatoes, milk, butter, eggs, and other comestibles. He mentioned those foods particularly, for they are often difficult and certainly expensive to obtain. "Everyone who has lived in the West," he said, "knows what a heartbreaking job it is to grow vegetables without watering them every day." Our first business, therefore, was to make vegetables and fruit procurable in the western country regularly and at reasonable prices.

Red Scale of Citrus.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

OF the insects which attack citrus trees throughout the world probably none is more feared by growers than the red scale, and in so far as Queensland is concerned it must be counted as one of the most important factors limiting the production of citrus fruits. Other pests and diseases annually cause heavier losses over restricted areas or operate more extensively for limited periods, but red scale, in addition to being definitely the most important pest in some of the best citrus districts, is an ever-present menace in all. Even in those parts where it is ordinarily of but little consequence, as soon as conditions become suitable, which happens quite frequently in most parts, the scale quickly asserts itself and takes heavy toll of both trees and crop. On the whole, however, considering that the climatic conditions are theoretically so favourable for the development of the pest, Queensland orchardists must be considered fortunate that their losses are not much greater than is actually the case.

Description.

Actually, on the tree the insect itself is not usually seen, as whilst it is still of but minute size the insect exudes a secretion which completely covers the body. This secretion, or scale, as it is usually called, is of parchment-like texture and is only semi-translucent, and thus effectively hides the body of the insect from view. The scale of the female is circular in outline, slightly flattened at the margins, raised to a point towards the centre, and measures one-tenth of an inch in diameter in full-grown individuals. The central point is commonly of lighter colour than the remainder. The scale of the male is elongate and the raised portion, instead of being at the centre, is found towards the anterior or head end. Otherwise the scales of the sexes are similar. Though for most specimens the vernacular name describes the pest quite well, variations do occur, and at times the colour may appear reddish-brown or less often almost grey.

If the scale be removed from the female the insect is found to be roughly circular in outline, fat, and sluggish-looking, and generally of a deep-yellow or creamy-yellow colour. The female is legless and the most conspicuous feature is the structure of the mouth parts. These are rather complicated, but under a low-power lens appear to form a long, slender tube fitted for piercing, the length of which commonly easily exceeds that of the insect's body. The adult male is very different from the female, being a minute elongate creature with long legs and a pair of exceedingly delicate wings which are so fine that the slightest touch will tear them, and even the lightest breeze may dislodge them from the insect's body. The male again differs from his mate in that he has no mouth parts, the place of these having been taken during development by a pair of simple eyes. The male, of course, cannot feed and does not live long; probably twenty-four hours would be the longest adult life under ideal circumstances.

Life History and Habits.

The female does not lay eggs, but gives birth to living young, which remain for a day or two beneath the scale of the mother and then wander out to seek a feeding site. As a general rule they do not migrate far,

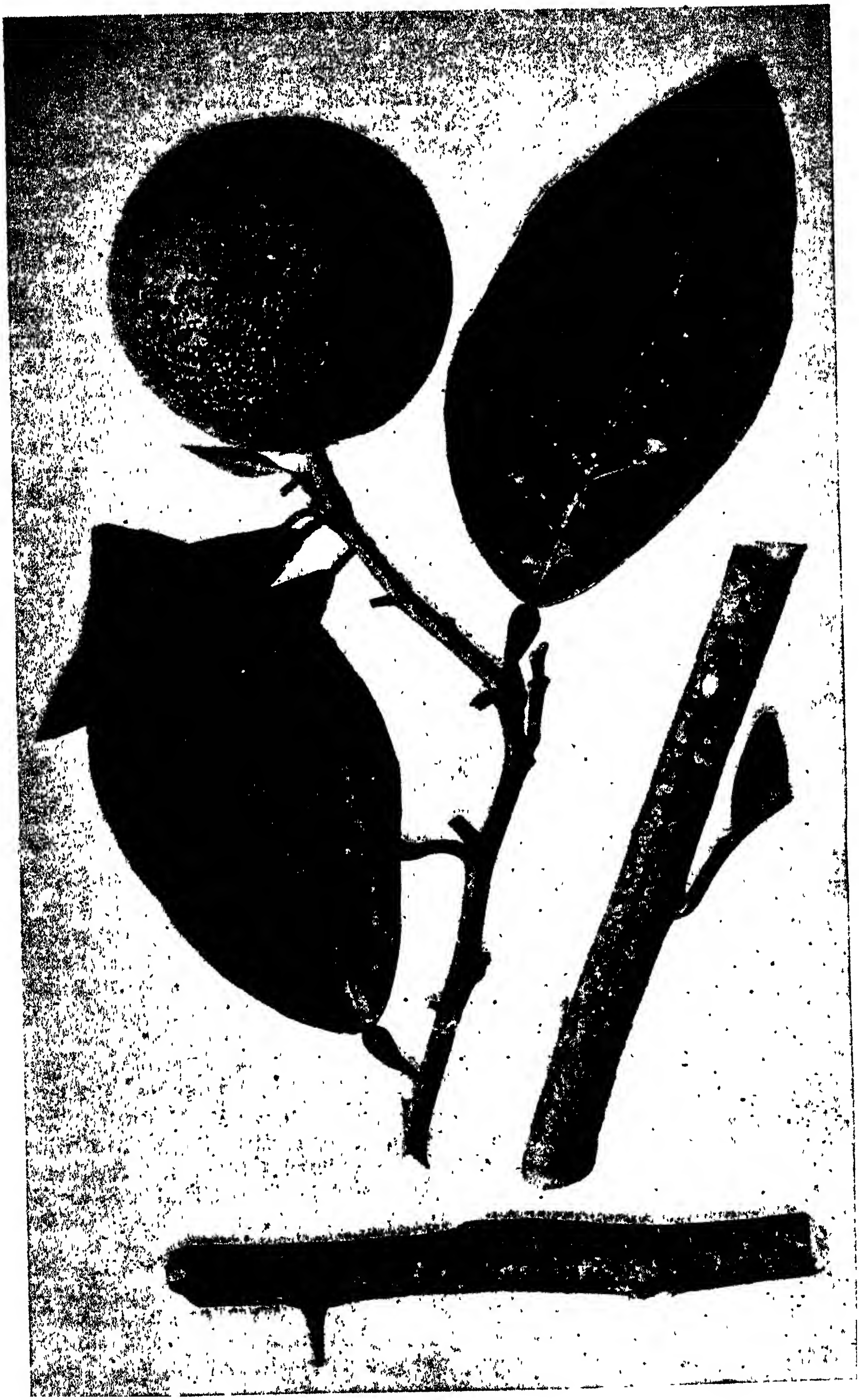

PLATE 67.
Red Scale, showing infestation of fruit, foliage, and woody twigs.

but they are so minute that a very light breeze is capable of dislodging them and carrying them considerable distances. It is, in fact, largely by means of the wind that dispersal about an orchard or countryside is accomplished. As soon as a suitable site is found at which to feed the young settle down, insert their mouth parts, and from that time onwards, in the case of the female, do not move for the rest of their lives.

Red scale breeds practically continuously throughout the year in Queensland. Each female is capable of producing about eighty young, and these emerge over a period of about fifty days. Once reproduction is commenced it goes on continuously until just before the death of the female. As the great majority of the individuals complete the life cycle in approximately sixty days during the warmer weather, there is no clearly defined succession of generations. Experimentally it has been found that normally there are five complete generations each year in this State.

In Queensland the pest reaches its maximum intensity in the drier and hotter parts, and in every district it becomes more important in abnormally hot, dry times. The increase in importance is due both to the fact that effective reproduction is considerably increased and also on account of the trees at such times being less able to withstand its depredations.

The state of the tree as regards health and vigour is, in itself, an important factor in determining the extent to which it will be attacked by red scale. Invariably the more sickly a tree the more it will be favoured by this scale. Furthermore, the pest is usually confined at least in the first instance to the weaker and more woody parts where there is no great flush of sap. In the same way varieties which carry much tender supple wood are less prone to attack than the more woody and harsh varieties. Thus the free-growing Emperor of Canton mandarin, when healthy, is seldom found to harbour the pest, whilst lemons and grape fruit rarely fail to support appreciable colonies.

Red scale prefers parts exposed to the sun to those which are shaded, thus the first infestation on normally foliaged trees is to be found on the twigs, leaves, and fruit (Plate 67). On open or scraggy trees, however, the scale may be found on all parts even at the base of the trunk. Young trees, which, of course, have scarcely any part effectively shaded, are almost invariably subjected to the ravages of the pest.

It is a voracious feeder, and no plant can long sustain the depredations of a large colony. Weakening and killing of leaves and twigs is rapidly accomplished, and young worked trees may be killed back to the union of the bud and stock within a few months by colonies which cannot be considered very large. On older trees red scale frequently paves the way for the entry of other pests and diseases, and it is usually by the combined efforts of these that the tree is finally killed.

When infesting the fruit, though direct damage is done, in most cases the principal objection is that the fruit is rendered unsightly and must be brushed before it can be marketed. This brushing, besides costing both time and money, is bad for the fruit, as the rind is, contrary to the general impression, very tender. The injury to the rind is seldom apparent to the naked eye, but the surface cells are disrupted and this facilitates the entry of mould fungi and thus leads to loss of

fruit. This is an indirect effect of the scale but the loss must be attributed mainly to the pest. The direct effects are chiefly arrested development and reduction in size.

Red scale breeds freely on fruit stored after harvesting and the young crawl from fruit to fruit and box to box. As lemons are usually stored for a few months after being picked, this is a most important point, for one badly-infested fruit may lead to the whole consignment becoming affected. Care must therefore always be taken to see that no fruit harbouring living red scale is included in a storage lot.

The pest is attacked by a number of natural enemies, and at times these certainly accomplish an appreciable measure of control. However, it is rarely possible to rely on natural enemies to materially reduce the population once this has assumed pest proportions, and growers generally must adopt artificial means of control.

Control.

The first step in the fight against red scale in humid coastal districts is to attend to the general health of the tree. It may be that some other pest or disease is adversely affecting the tree, but more commonly all that is required to reduce the red scale population to insignificance is the judicious use of fertilizers coupled with good cultural practice. Of course, direct methods of control will also have to be used in these cases in the first instance.

In drier districts where the insect is a pest of otherwise healthy trees, or in other parts when the health of the tree is being attended to, artificial control may be accomplished by fumigation or by the use of certain sprays. Where conditions permit of the operation, fumigation with hydrocyanic acid gas is to be recommended as the best method of combating the pest. Oil sprays, preferably white oils, or resin-caustic soda-fish oil mixture may also be used with success.

As important as the choice of insecticide is the choice of time of application. Even if an excellent kill be obtained it does not necessarily follow that a lasting control will be established. If the control operations are carried out just before a period of prolific reproduction, it is obvious that the population may be again built up quickly.

By far the best time to combat red scale in Queensland is from the middle of March to early in April. If a good control be established at this time, even in the most severely affected districts, the trees will normally remain commercially free of the pest for at least twelve months. The later the operation the better, but it must always be remembered that red scale may require a month or more to fall from the fruit after death and the fruit may still require brushing unless a sufficiently long interval elapse between treatment and harvesting. Further, oil sprays if used too late tend to interfere with the artificial colouring, and late application of this class of spray should, therefore, be avoided on those early varieties which normally have their sweet juice content some time before the colour turns. In western districts the scale may build up large populations as early as January. All that can be done then is to water the trees as heavily as other conditions permit and in this way hold the condition of the trees as long as possible.

Young trees which are heavily infested when they arrive from the nursery should not be accepted, as such trees are very liable to be either killed altogether or stunted during their early life, and are thus never satisfactory. Any young trees may carry a light infestation and this does not matter greatly as it will be found that with most varieties the infestation is thrown off as soon as the trees become established. Light oil sprayings may be given to young trees, but care must be taken. The soil round the base of the trunk should be hilled up during the spraying and then pulled back. This prevents any accumulation of oil round the union or close to the roots where it has far-reaching ill-effects.

QUEENSLAND SHOW DATES, 1935.

February.

Stanthorpe, 6 to 8.
Killarney, 15 and 16.
Clifton, 27 and 28.

March.

Allora, 6 and 7.
Milmerran, 12.
Goombungee, 15.
Pittsworth, 20 and 21.
Warwick, 26 to 28.

April.

Toowoomba, 1 to 4.
Tara—Show 3, Campdraft 4.
Dalby, 10 and 11.
Crow's Nest, 10 and 11.
Oakey, 13.
Kingaroy, 11 and 12.
Chinchilla, 16 and 17.
Nanango, 16 and 17.
Miles, 24.
Sydney, 15 to 24 April.
Dirranbandi, 24 and 25.
Rosewood Campdraft, 27.
Taroom Campdraft, 29.

May.

Wallumbilla, 1 and 2.
Taroom, 1 and 2.
Beaudesert, 1 and 2; Campdraft, 3 and 4.
Wondai, 2 and 3.
Goondiwindi, 3 and 4.
Longreach, 6 to 9.
Murgon, 9 to 11.
Blackall, 13 to 15.
Mitchell, 15 and 16.
Mundubbera, 15 and 16.
Goomeri, 15 and 16.
Barcaldine, 21 and 22.
Ipswich, 21 to 24.
Gympie, 22 and 23.
Biggenden, 23 and 24.
Toogoolawah, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.

June.

Marburg, 1 to 3.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Boonah, 12 and 13.
Esk, 14 and 15.
Warrilview, 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Gatton, 3 and 4.
Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Cairns, 23, 24, 25.
Atherton, 30 and 31.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.

September

Imbil, 6 and 7.
Tully, 13 and 14.
Innisfail, 20 and 21.
Rocklea, 21.
Kenilworth, 28th.

Top Rot of Pineapples and Its Control.

By H. K. LEWCOCK, M.Sc., B.Sc.Agric., Assistant Plant Pathologist.

TOP rot is a disease of pineapple plants which is becoming increasingly prevalent in Queensland. At the present time the losses occasioned by this disease are exceeded only by those resulting from wilt.

As the name implies, top rot destroys the white, succulent, terminal portion of the stem as well as the bases of the young heart leaves which arise from it. The tough, outer leaves and the lower woody parts of the stem are rarely affected. In some localities in Queensland this disease is referred to as "wet rot," whilst in Hawaii it is known as "heart rot." The latter name is particularly appropriate.

Description of the Disease.

Top rot usually occurs in young plants before they have fruited, but older plants may sometimes be affected. Shortly after infection occurs, the central or heart leaves of diseased plants exhibit pronounced colour changes ranging from a drab olivaceous green to shades of red, but the outer leaves may retain their normal green colour and rigidity until the disease is well advanced. Affected leaves, being cut off from their water supply, dry out rapidly and curl backwards along their edges. When this occurs, they take on a characteristic smoky-brown appearance. In the final stages of the disease, the rotted tissue disintegrates and the leaves fall prostrate on to the ground.

A slight pull will detach the terminal crown of leaves from the stem of a top rot-affected plant, even before the foliage symptoms have become well-defined, and this is a useful method of identifying the disease in its initial stages. The bases of affected leaves display a foul-smelling, putty-coloured rotted area, which is sharply demarcated from the upper green parts of the leaves by a very distinct and characteristic brown margin. The apex of the stem exhibits a similar type of rot which, ordinarily, does not extend into the woody, fibrous tissue of the rootstock. This stem rot is also characterised by a well-defined brown margin.

Suckers sometimes shoot from the woody rootstocks of plants which have been affected with top rot. These new growths may remain healthy and ultimately produce fruit, but usually they succumb to the disease at an early stage in their development.

Cause of the Disease.

Top rot is an infectious disease caused by a fungus which invades the plant through fresh cuts or injuries, through decaying roots, or through the tender apical tissues of the stem. In Hawaii, it has been reported that several related fungi belonging to the genus *Phytophthora* are capable of causing top rot in pineapples, but only one of these, *Phytophthora cinnamonii*, has been found to be associated with the disease in Queensland. *Phytophthora cinnamonii* is also an active cause of pineapple wilt. In the latter disease the fungus attacks and destroys the roots, and it has been found that top rot may sometimes develop from such root infections should the rotting of the root tissues continue upwards into the stem. The initial sporadic top rot infections, which usually appear about mid-winter, may frequently be traced to diseased

roots. If these first-affected plants are not quickly removed, they may later become centres from which a widespread infection of other plants occurs at or above the ground level. Under favourable moisture and temperature conditions, fungus spores are liberated from the rot-affected leaf bases and stems and, during heavy rains, these spores are disseminated to healthy plants by the movements of surface water.

The causal fungus of top rot is able to survive in the soil for considerable periods of time, and since it is also an active parasite of pineapple roots the disease is likely to reappear indefinitely on land once it has been contaminated with the fungus.

Factors Influencing the Occurrence of the Disease.

Losses from top rot occur chiefly during the winter and spring months. Young plants up to twelve months old are most subject to attack, but mature plants which have fruited may also occasionally succumb to this disease.

The occurrence of top rot in a field of young pineapples may be restricted to isolated plants scattered here and there throughout the plantation, but it is more usual to find certain areas exhibiting a high degree of infection whilst the remainder of the plantation is practically free from the disease. A loss of from 50 to 60 per cent. has been noted over portions of affected plantations. The Ripley Queen pineapple appears to be more susceptible to top rot than the more widely-grown Smooth Cayenne variety, but this is possibly due to the fact that the former variety is grown almost exclusively in the neighbourhood of Brisbane on soil which is frequently both shallow and poorly drained.

The incidence of top rot disease and the extent to which it may develop is largely determined by environmental conditions. Within a given field these may vary considerably from year to year. In Queensland top rot causes serious losses only in seasons when the rainfall is exceptionally heavy. Even in wet years, however, epidemic outbreaks of the disease are restricted to low-lying, shallow, and inadequately-drained soils or to relatively flat land which is subject to flooding during heavy rains. Differences in topography explain why the disease has long been prevalent in some localities but quite unknown in others.

Plants propagated from tops or slips are more susceptible to the epidemic form of the disease than those grown from suckers. The loose, open structure of the first-named types of planting material renders their tender heart tissues especially subject to pollution by contaminated flood waters, and thus the chances of infection taking place are greatly enhanced.

Control Measures.

Although the causal fungus of top rot is also the organism chiefly responsible for the losses occasioned by pineapple wilt, different parts of the plant are involved in these two diseases, and somewhat different methods of control are required to combat them.

Top rot seldom causes serious trouble on sloping, well-drained land and, consequently, no special precautions are necessary in hilly districts except to dig up carefully and then destroy any affected plants as soon as they appear. If this is not done, the disease may spread downhill from the diseased plants over narrow fan-shaped areas. On relatively flat land, however, or in shallow, poorly drained soils, it is recommended

PLATE 68.
Longitudinal section of Pineapple affected with Top Rot.

that the suckers or slips be planted on low ridges in order to ensure a quick run-off of surplus water from around the roots, and also to avoid the possibility of contaminated flood waters coming into contact with the young plants.

Objection has been taken to the ridge method of planting on the ground that by the time the plants are three or four years old they are so far out of the soil that the ratoon or sucker growths cannot root properly, but this can be obviated to a large extent by continually working the soil up towards the plants. However, whether the ridge method of planting is adopted or not, plantings on flat country should on no account be made in shallow trenches. When this is done, water collects in and flows along the trenches during wet weather, with the result that whole rows of plants may become infected with the top rot fungus. This is particularly likely to happen when a few scattered diseased plants are present in a plantation, as, under favourable conditions, these may become potent sources of infection. It is obvious, therefore, that plants affected with top rot should be carefully removed from the plantation as soon as they are detected, since further spread of the disease may be considerably checked in this way. Even when a new sucker growth appears from below the rotted region of the stem it is unwise to leave the rootstock in the ground, as the remains of the previously rotted portion may later serve to spread the disease to other plants.

In Hawaii immersion of suckers or slips in a fungicide prior to planting has recently been recommended as a preventive treatment against top rot when replanting land on which the disease has previously been in evidence. The fungicide used is a specially-prepared Bordeaux mixture consisting of 1 lb. of crystalline copper sulphate (bluestone "fines") and 1 lb. of fresh hydrated lime to every three gallons of water. Fresh burnt lime (quicklime) may be substituted for hydrated lime where the latter is not available, but only three-fourths of the quantity is required—viz., ¾ lb. of quicklime to each three gallons of fungicide. The procedure recommended by Mehrlich in Hawaii for preparing and using this Bordeaux mixture is as follows:—The bluestone is first dissolved by suspending it in cheesecloth in one-half the quantity of water required for the complete fungicide, using an open wooden cask or a well-tarred oil drum as the container. Shortly before the Bordeaux is to be used, the hydrated lime is thoroughly mixed with the remaining water in a separate container. While stirring the copper sulphate solution the lime suspension is poured into it. The mixture should be thoroughly stirred both before and during treatment of the suckers or slips. Before use, however, the freshly-prepared fungicide should be tested in the customary way with blue litmus paper or a clean, bright knife blade. Only vigorous suckers or slips which have been stripped about two weeks prior to planting should be selected for treatment with this Bordeaux dip. These should be wholly immersed in the freshly-prepared fungicide, preferably in the field where they are to be planted, and they may be planted either before or shortly after the fungicide has dried upon them.

Mehrlich reports that this Bordeaux mixture dip has given better control of top rot than larger quantities of the same or different fungicides applied in other ways. In repeated tests under conditions extremely favourable to the disease, an average control of 80 per cent. has been obtained from its use. When the fungicide is prepared

according to the procedure outlined in the preceding paragraph no injurious effects have been observed to result from its use, but on account of the cost and labour involved it is probable that it will be found economical to employ it only for treating planting material intended for old land on which outbreaks of top rot have occurred in previous plantings. On new land cultural precautions alone should give an adequate measure of control.

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The Common Bracken.

(Pteridium aquilinum.)

By C. T. WHITE, Government Botanist.

Description.—A coarse, robust fern with creeping underground stems often covering extensive areas of country. Fronds erect, mostly 2-3 feet high and 1-2 feet across, but varying considerably in size according to situation and locality. Spores borne on the under surface of the fern in long, narrow lines close to the margins of the lobes of the frond.

Distribution.—Bracken in one form or another is widely spread over both the temperate and tropical regions of the world. Many varieties of it have been described.

Botanical Name.—*Pteridium,* meaning similar to *Pteris,* a very large genus of ferns; *pteris* was the name applied by the ancient Greeks to ferns in general; *aquilinum,* from Latin *aquila,* an eagle, from the old English name of the plant—Eagle Fern.

Uses.—In Europe Bracken has been used from time immemorial for a multiplicity of purposes—the young roots cooked as greens, the rhizomes ground into a meal for adding to ordinary flour, the fronds as thatch for houses and bedding for animals, both stems and leaves for distilling a root beer with supposed tonic virtues, the ashes for the manufacture of soap and glass, the whole plant as a tan for dressing kid and chamois leathers, &c.

Poisonous Properties.—It has been definitely proved by feeding tests in England and elsewhere that the Common Bracken is poisonous to stock, though apparently large quantities of it have to be eaten before any ill-effects are noticed. Cattle affected by Bracken Fern generally show prominent gastric trouble accompanied by emaciation and a high temperature. In cases of reputed bracken-poisoning in Southern Queensland a feature recorded has been bleeding at the nostrils, and this condition is one recorded in feeding tests in England. Young stock seem to be more affected than old. In cases of bracken-poisoning in New South Wales, Seddon and McGrath record the principal features to be loss of condition, diarrhœa and dysentery, and death as a rule after a comparatively short period of illness, or less commonly only after two or three weeks. They further state that the Bracken is only indirectly the cause, the real trouble being due to a microbe which is responsible for the symptoms of fever, dysentery, and hæmorrhagic septicæmia. They state that the microbe associated with the disease is not capable of producing ill-effects in healthy stock, and that mortalities are really due to the Bracken, which lowers the resistance of the animal to the disease. They report that their investigations at the Glenfield Research Station have definitely shown the relationship of the two conditions, and that Bracken is to be regarded as a very harmful foodstuff.

Eradication.—In coastal Queensland Bracken is often a serious pest of pasture land. In very light, sandy soil the fronds with portion of the rhizome or underground stem can be pulled up. In ordinary pastures, however, this is not usually practicable, and the usual practice

Plate 69.—The Common Bracken.

is to knock down the fronds with a stick, experienced farmers stating this has more effect on the plant than mowing or cutting off with a sharp implement such as a fernhook or brushhook. Heavily pasturing the land, particularly with steers, who eat the young shoots and break down a lot of the fronds by camping on them, is said to work well in keeping the fern in check in larger areas.

Botanical Reference.—Pteridium aquilinum (L.) Kuhn, v. Deck Reisen 3, Bot. 11, 1879; *Pteris aquilina* Linn. sp. 2, 1075, 1753.

Lameness in Pigs.

By K. S. McINTOSH, B.V.Sc., Government Veterinary Surgeon.

LAMENESS in pigs may be classified into four groups:—

1. **Rickets.**—This condition is due to insufficiency of mineral matter in the feed and lack of the essential vitamine which enables the animal to utilise same.

The hard supporting substance of the bones consists largely of calcium (lime) and phosphorus, and unless the animal receives an adequate supply of these materials its bones do not develop normally (*i.e.,* become hard and flinty) but become soft and spongy.

The effect of this bone weakness is most noticeable in the limb bones, as these carry the weight of the animal. The legs may become either "bowed" or "knock-kneed" and there is usually some enlargement at the joints. These enlargements are not very painful, but there is a tenderness of the joints and bones and this, together with the physical deformity, causes an irregular and disturbed gait.

If such an animal be killed and a postmortem examination held the bones may be easily pared with a knife, the ribs break like cardboard, and a row of enlargements is seen at the junctions of the ribs and their cartilages.

Calcium and phosphorus also assist in the formation of many other tissues such as blood and muscle, and for this reason affected pigs are often poor, weedy, and more prone to other troubles such as indigestion owing to impaired vitality.

The age at which pigs are most commonly affected is from the weaner to the porker stage. Brood sows are also liable to be affected since the formation of the young pigs or fœtuses and the subsequent drain through the secretion of milk demand large quantities of mineral matter which are supplied by the sow.

The prevention of rickets lies in proper feeding. Fortunately we have a cheap and effective mineral supplement in ground rock phosphate and an easily procurable supply of vitamine in green leaves. Lucerne is particularly recommended, as it is an excellent feed for pigs and contains a relatively high proportion of vitamines. Wherever ground is available an attempt should be made to grow lucerne. It has been found that pigs fed on a diet of skim milk and maize frequently develop rickets, but if greenstuff is fed daily, also 1 dessertspoonful of ground rock phosphate per pig per day, no such trouble is encountered. In addition, pigs will gain more rapidly in weight when the mineral and greenfeed supplement is used.

2. **Germ Invasion** of the joints and adjacent structures. Infection of pigs may take place at or shortly after birth via the navel cord, or later by the ingestion of contaminated feed, &c.

In early infections the trouble is usually severe and the course rapid, many of the young pigs dying within a week or so.

Later infections may affect the joints and adjoining structures, causing the formation of pus swelling and inflammation of the part with severe lameness. The knees and hocks are most commonly affected,

then the stifle and elbow joints. The part is very painful and there may be a discharge of pus from the swelling through one or more small openings.

In New South Wales another germ was found which attacked the ends of the bones just under the joint cartilage, and whilst the lameness and pain are very severe no very striking changes can be seen. If the bones of an affected joint are boiled and the cartilage stripped off, the joint surface of the bone (*i.e.*, under the cartilage) is found to be distinctly pitted. This form has also been found in Queensland.

The above germ diseases are associated with bad methods of housing, feeding, and hygiene. When pigs are affected it pays to get rid of them as soon as possible before they lose condition. In the case of suckers suffering from navel infection do not waste time in treatment, but concentrate on preventing trouble in subsequent litters. Allow the sow to farrow under scruplously clean conditions and this trouble will disappear.

Throughout its life the pig should be kept under condlitions of strict cleanliness. The animal should have adequate shelter from sun, rain, wind (particularly draughts), and should not be kept in damp, muddy sties. Mud wallows are undesirable from every standpoint.

Feed troughs should be made of iron or concrete and kept clean. It is impossible to clean a wooden trough thoroughly and the small extra expense incurred in purchasing suitable troughs will be repaid later by healthier pigs. Clean, fresh food and clean containers and utensils are of paramount importance. Many farmers believe in feeding "sour" skim milk, but, unfortunately for the pigs, this means not pure sour milk as we see in a cheese factory, for example, but putrid or decomposed milk. It is usually held before feeding in a cask or vat crusted with the accumulation of months—perhaps years—of decomposing material, containing countless millions of putrefying and perhaps disease germs.

Is it any wonder that when such is given to young pigs lameness, digestive and other troubles occur?

3. **Suppurative Otitis.**—Strictly this is not a lameness but a loss of sense of equilibrium and direction caused by the formation of pus in one or both ears. In each ear there is a delicate system of "spirit levels" which gives the pigs their sense of direction. When these are destroyed by pus formation the pig moves in circles, usually with the affected ear down towards the ground.

The ear infection is usually an extension of some catarrhal condition of the throat, but the germs may possibly gain entrance via the outer ear. Many people believe that the condition is caused by pouring milk into the pig's ears during feeding, but probably this is not a common cause.

For prevention strict attention should be paid to housing, feeding, cleanliness, and general management as outlined above.

4. **Pig "paralysis."**—This obscure condition has been investigated by a number of workers—notably W. A. C. Frazer, at Glenfield Research Station, New South Wales.

The symptoms are loss of co-ordination of the muscles of the hind limbs. Crossing or plaiting of the hind legs and knuckling over on the

fetlocks are early symptoms. Later the animal is totally unable to support its hindquarters and progresses by means of the front legs. In time the front legs may also be affected. The voice changes to a high-pitched "falsetto monotone."

Whilst the animals can get sufficient feed and drag themselves about they frequently retain their condition which is usually good, but if the forelegs are affected they commence to lose weight.

The cause and treatment of this complaint is at present unknown, and the most economical method is to sell the affected pigs to the butcher before the trouble is too far advanced.

5. **Miscellaneous.**—Under this heading we may include wounds, fractures, tuberculosis of bones and spinal column, inflammation and growths of the brain and spinal cord, and parturient paraplegia of sows. The last-named is associated with the act of farrowing. Just before or just after the act the sow suddenly loses the use of her legs. Good nursing and laxative diet are the main methods of treatment.

Kidney worm is often thought to be the cause of staggery gait, but the latest work has shown this to be extremely rare. Occasionally a worm will "wander" into the spinal canal and cause staggering, but if situated in the normal position, *i.e.*, kidney fat, such is not the case.

Any disease such as pneumonia, severe enteritis, infestation by parasites, &c., which causes general disturbance of the body functions, may cause muscular inco-ordination or staggers, and here, of course, treatment lies in eradicating the primary trouble.

This article has touched on several complaints of pigs which are not true lameness but which cause disturbance of gait, but as these are often confused with true lameness they should be taken into consideration by the farmer if locomotory troubles should arise.

In conclusion remember that—

Strict cleanliness of sties and feeding utensils,

Proper feeding,

Adequate shelter and housing,

Protection against internal and external parasites (see advisory leaflet No. 2),

are the fundamentals of profitable and successful pig raising.

TO MAKE WHITE LEATHER.

Soak the hide for forty-eight hours in clean cold water. For fleshing and unhairing, make up ½ lb. unslaked lime and ¼ lb. salt to each gallon of water required to completely immerse the hide, and soak for twenty-four hours, when most of the hair and flesh can be scraped off. Make up a second soak, using lime only. Then the hide can be scraped free of every particle of hair and flesh. A further soaking in clean cold water will then be necessary. For a first curing soak, use 4 oz. alum to each gallon of water, and for the second, 6 oz. About two days in each will be sufficient. Before the hide is taken out, cut it and see if there still remains a streak of colour inside. The curing must go on until the hide is white right through. Allow the hide to partially dry in a dark place away from the wind, and then rub in as much fat, tallow, or melted paraffin wax as it will hold.

Litter Recording of Pigs.

By L. A. DOWNEY, Instructor in Pig Raising.

THE value of litter recording has been stressed by this Department on numerous occasions, and at least one pig breeder has taken up the work in earnest.

In the August issue (1934) of the "Queensland Agricultural Journal" there appeared a report of a litter of Large White pigs owned by Mr. A. G. Stewart, of Strathmore Stud, Cedar Pocket, via Gympie. This litter, from the sow "Highfield Jewel 4th," was reared by hand owing to a mishap to the sow; it consisted of nine pigs, which weighed 459 lb., or an average of 51 lb. when eight weeks old.

The next litter tested at Strathmore Stud was from the Large White sow "Norfolk Bonetta 4th." This litter consisted of eight pigs, which averaged 48½ lb., a total litter weight of 388 lb. at eight weeks old, and as this litter was exhibited at Brisbane Show the rate of growth was probably retarded somewhat owing to transport and changed environment.

The last litter to complete its test at Mr. Stewart's stud is from the Large White sow "Highfield Jewel 4th," and sired by "Gatton Junker." Thirteen live pigs were born on 9th November, 1934, one pig died on the following day and another was taken from the sow on that day, leaving her with eleven pigs.

The birth date and final weights of this litter were checked by officers of the Department and are shown as follows:—

	Boars.							Sows.			
Tattoo Number.	65	66	67	68	69	70	71	72	73	74	75
Weight at birth ..	3	3	3	3	3	2½	3	3½	3½	2	3
,, ,, 1 week	5½	7	6½	6½	6½	5½	6	7½	7½	3½	5½
,, ,, 2 ,,	10	12	11½	11½	11½	7	11	12½	12	7	9
,, ,, 3 ,,	15	16½	16	16	15½	8½	16	17	16	10	11½
,, ,, 4 ,,	18	19	18	20	19	10	17	19	19	11	13
,, ,, 5 ,,	24	23	22	23	25	14	23	22	26	14	16
,, ,, 6 ,,	30	34	30	80	34	20	29	27	33	19	21
,, ,, 7 ,,	36	38	35	38	39	28	35	34	40	27	30
,, ,, 8 ,,	43	43	41	46	46	35	42	40	47	34	36

Total at 8 weeks .. .. 453 lb.

Average at 8 weeks .. .. 41·1 lb.

The Identification of Pigs.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising and Supervisor of Grading.

AS Regulations under "*The Queensland Pig Industry Act of* 1933" make identification of all pigs offered for sale or disposal compulsory, farmers, agents, dealers, and others interested in the sale and purchase of pigs should be conversant with the various systems of identification of this class of animal and of their application in accordance with the Act and Regulations.

For instance, Regulation 6 reads as follows:—

"Every pig offered for sale, barter, or exchange shall be branded by the vendor with a body tattoo or other approved method of branding. In the case of sucker, weaner, store, or other pigs not intended for immediate slaughter, ear-tattooing, or earmarking shall be an approved method of branding. Such branding shall take place within seven days prior to such sale, barter, or exchange."

REGISTRATION OF BRANDS.

Departmental stock inspectors stationed in various centres throughout the State are in a position to advise farmers as to the advantages or otherwise of registration of earmarks for pigs, and their services should be requisitioned by all farmers who are in doubt on any of these matters, especially as it is necessary in effecting registration to have particulars of any registered marks used by neighbouring farmers.

There are five or more systems of identification of pigs in regular use in this State, each of which has its own particular advantage. These systems are ordinarily defined as follows:—

Firebranding;

Body-tattooing;

Earmarking (inclusive of use of ear tags) and ear buttons;

Ear-tattooing;

Paint and hair-clip marking (inclusive of cutting of hair on tail—i.e., bang-tail).

MARKING SYSTEMS.

Firebranding.

For marking live pigs this system of identification has been in use throughout the world for many years and is used frequently by farmers here, especially by those who are not conversant with or in favour of other systems.

It may be said that while there are many objections to identifying pigs by the use of a redhot iron brand, the system has its place and doubtless will continue to be used until a more efficient system of identification of the live animal is introduced. Efficient firebranding has the advantage that it is a method of marking live animals as well as carcasses; in itself the system is an effective one if carefully applied with a suitable brand that is not overheated, or held too long, or pressed too deeply on the body, as it results in a reasonably clear and legible skin and body mark. It is the abuse of such a system which brings it into discredit, and firebranding certainly is abused, as many otherwise suitable carcasses have to be degraded and many rejected by reason of excessive and cruel firebranding. Suitable iron and copper firebrands may be purchased at from 12s. 6d. to 15s. each, while there has also recently been introduced a self-heating branding iron for the firebranding of other classes of stock, such irons working on the principle of petrol-heated household irons and other electric heating appliances. It is hoped that eventually this old-time system of identification will be replaced by a more efficient and less objectionable method, but such a method of live-pig body marking has not yet been developed sufficiently for use on pigs, though acid, steam, and other types of brands have been used and are still undergoing research in this and other States.

For purpose of ascertaining the views of prominent men associated with the pork and bacon trades, circulars were recently forwarded by the Department to a number of bacon curers, pork exporters, and stock agents in this State asking them to express their views on firebranding. Practically all indicated a general desire for a better system than the use of the firebrand, especially for use in marking animals whose carcasses are intended for the export trade.

Firebranding has one special advantage in that is is used to identify live pigs belonging to various owners where such pigs are forwarded together as mixed consignments to auction sales and factories, consignments in which body-tattooing of carcasses would not be sufficient. In some instances, however, earmarking and ear-tattooing of such pigs could be used to just as much advantage and with less objection than firebrands.

Where properly applied, firebrands on pigs will be legible for two months or more, but after that period they gradually disappear and are difficult to decipher either on the live animal or on the carcass, and thus they become unreliable and objectionable.

Body Tattoo-marking.

This is an efficient and the most practical system of marking in the identification of pork and bacon pig carcasses, and during recent years has been almost universally adopted by bacon curers and pork exporters in Queensland. Correct identification of carcasses is an essential in the treatment of pigs by factories, and more particularly where payment is made on a basis of official grading; hence the necessity for a reliable method such as this.

Additionally, it is necessary to identify owners of pig carcasses in order that refunds or non-payments may be correctly adjusted where, on slaughter, carcasses or parts thereof are condemned by Government inspectors as unfit for the use of man. Body-tattooing is particularly valuable in thus identifying ownership, and also in providing necessary information in tracing diseased animals to the farm, saleyards, or other place of origin.

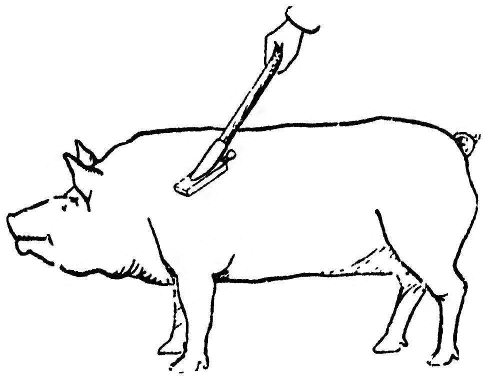


PLATE 70.

The Austral pig-body tattoo showing position favoured for the identification mark on the carcass. This instrument has needles of the gramophone type, and is supplied by manufacturers complete with nickel-plated headpiece and wooden handle. The numerals are mounted in polished aluminium blocks, the positions being altered in a few seconds by means of the adjusting screw. Spare numerals and dummy blocks may be ordered; tattoo ink is supplied in quantities as required.

[Illustration by courtesy of Taylor and Elliotts Ltd., Brisbane.

The body-tattoo instrument (*see* Plates 70 and 71) is a simple, comparatively inexpensive device for bodymarking pigs. The hammer head or that portion in which the letters or numerals are inserted is made of aluminium or nickel-plated steel; the tattoo needles are of similar type to gramophone needles, either pencil-pointed, grooved, or otherwise, according to style of instrument used. There is an adjustable screw to fix letter blocks in position, the handle being of hardwood or other material; the headpiece of the body tattoo is the heaviest portion of the instrument, this to provide weight and thus provide for better results in marking. The letters, symbols, and/or numerals used would, of course, vary in each case, the owner's brand or symbol always being used and a different numeral inserted for each lot of pigs marked. By the use of four or a complete set of blocks, a considerable number of combinations may be arranged for. thus enabling large numbers of pigs to be marked without duplication. A tattoo mark properly applied is sufficiently permanent to enable its use to be extended and to be included among the systems recommended where identification is compulsory or necessary.

This method of identification has been given extensive trial and has given general satisfaction, but the measure of efficiency is entirely dependent upon the care used in handling the instrument and the provision of a sufficient supply of suitable ink or paste. The quality of

the paste or ink used is most important. Of several preparations that have been subjected to experiment in Queensland, four stand out as being superior to all others.

Indian marking ink (blue or black).—This pigment, while slightly more expensive than the others, is probably the most efficient and adaptable, and in actual use is very readily applied.

"Zebra" stove polish in paste form has given excellent results; so also has "Zebra" liquid stove polish sold under the trade name of "Zebo."

Sherwin-Williams' black paint in oil has been used extensively by the proprietary bacon factories with satisfactory results, and is also recommended.

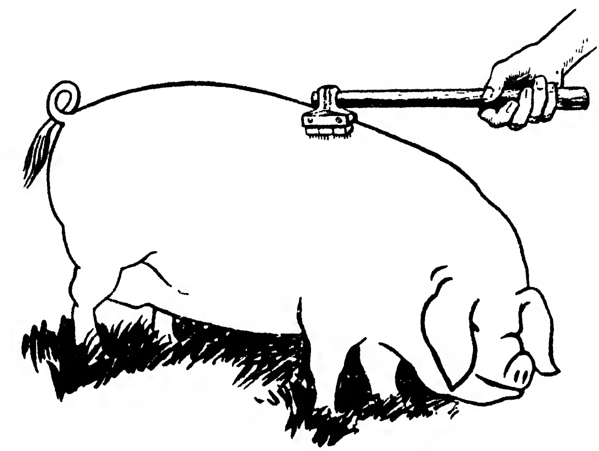


PLATE 71.

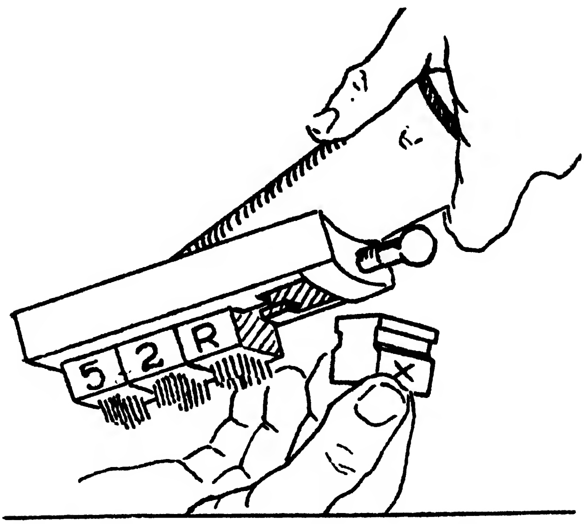
Sold under the trade name of the "Two-Way Tattoo Pigmarker," this instrument is constructed to withstand hard and constant use. The headpiece is made of aluminium with steel-pointed needles, the wooden handle being adjustable for use in two positions—one permitting use in hammer fashion, the other with spear-thrust action. The illustration portrays a favourite position for branding.

[*Illustration by courtesy of Smiths, Stamp Makers, Brisbane.*

These preparations are readily procurable in country centres and are relatively so inexpensive there is no need to use any other. If not obtainable locally, they may be obtained from city firms, price varying from 6d. per tin of stove polish to 3s. 6d. per bottle of blue or black Indian ink.

In actual use it is necessary to have a soft pad or other container to carry the paste, paint, or ink, and to hold this in the hand or affix it firmly in a convenient position out of reach of the animals. When all is ready, the tattoo needles are dipped in the paste or ink, the needles being well covered; the pig is then struck firmly with the marker (*see* Plates 70 and 71). The best position on the body for the tattoo mark is on the shoulder just off the top and slightly below top of neck. A sharp blow is required in order that the needles will penetrate the skin, and after each pig is marked the needles should be again covered with paste or ink. Actually, although the needles are sharp and the

blow heavy, the pig does not experience much pain and apparently does not suffer injury, for it is very rare that even a slight bruise is noticeable after slaughter if tattooing is done properly.



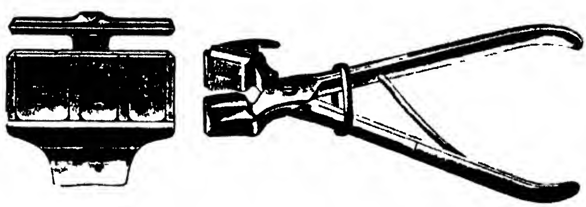


PLATE 72.

Illustrates method of inserting numerals or letters in body-tattoo instrument; also shows metal screw for adjusting position of blocks.

The lower figure illustrates the ear-tattooing device.

[*Illustration by courtesy of Taylor and Elliotts Ltd., Brisbane.*

It would be well here to again stress that this system of body-tattooing is not at present intended or recommended as a means of identification of live pigs—not even of white-skinned pigs. Its value lies in the legibility of the tattoo mark on the carcass; the ease with which the tattoo mark may be read; and the fact that its application does not result in disfiguration or any other objectionable feature. Again we stress that efficiency of tattooing as a means of identification is dependent upon—

(1) The efficient use of the tattooing instrument;

(2) The use of an instrument of a reliable type with strong, sharp needles;

(3) Taking time to do the job properly; and

(4) The use of a reliable brand of ink, paste, or paint.

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When Marking should be Done.

As the Regulations under the Queensland Pig Industry Act throw the responsibility of identification on the vendor, whether he be farmer, agent, dealer, or manufacturer's representative, it is essential the pigs be identified before sale or delivery; thus the pigs should be marked on the farm prior to despatch or be identified by the agent (1) when being weighed over the scales at the railway siding or loading-place, (2) when being penned for sale, or (3) when received for consignment direct to factories. The Regulations also make it compulsory for those persons handling pigs to keep records. Section 11 of the Act provides for this as follows:—

> "Every agent, auctioneer, dealer, factory, or butcher shall keep a record in respect to every transaction in pigs with which he is concerned.
>
> "Such record shall include the date, the number, description, and distinguishing marks of such pigs, the name and address of the vendor, and the name and address of the purchaser, and such other particulars as may be prescribed.
>
> "Such information shall be made available to an inspector upon request by the inspector to the auctioneer, agent, or dealer, as the case may be."

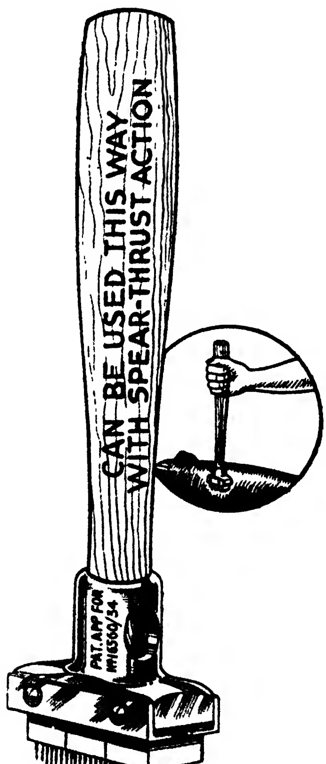


PLATE 73.

Showing handle of two-way tattoo in position for use where pigs are crated or in a position unsuited for use of the instrument as illustrated.

Illustration by courtesy of Smiths, Stamp Makers, Brisbane.

Where Marks should be Placed.

In all systems of identification it is essential that while being marked the pigs be confined in a small pen or race, or that they be marked in the vehicle in which they are to be transported (if such vehicle is convenient for the purpose). Where there is a lack of conveniences and the person identifying the pigs is inexperienced, it would be possible, in order to avoid duplication of tattoos, to attach a small pad soaked in ink or paste to that portion of the hammer head of instrument not fully occupied by letters or numerals, this merely to leave a paint mark on hair of the pigs as they are marked, for on black pigs in particular, when care is not taken, a pig may be marked twice in the same position unless some precaution is taken.

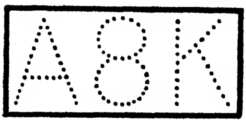


Fig. 1.

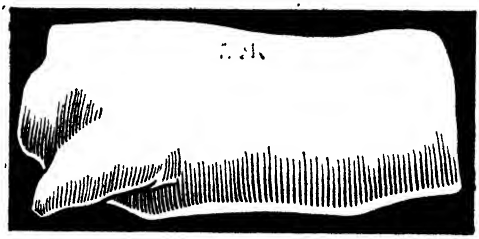


Fig. 2.

Plate 74.

Illustrating style of identification mark resultant from use of the body tattoo.

[Illustration by courtesy of Smiths, Stamp Makers, Brisbane.

After the pigs have been slaughtered and dehaired the tattoo letters or numerals show clearly in the form of black dots (*see* Plate 74, fig. 2), such tattoo marks being legible even if the pigs had been tattooed several weeks beforehand. In body-marking of pigs with tattoos there is no necessity for any preparatory treatment of area on which tattoo is to be applied, except that the area should be clean and free from accumulations of mud. The instrument should be kept in a clean condition, and sufficient ink or paste must be used, otherwise results will be unsatisfactory. Farmers not conversant with this method should attend at pig sales where tattooing is carried out.

Regarding the cost of body tattoos, a complete set, including hammer head, handle, stamp pad, and sufficient paste or ink for marking 100 pigs, will vary in price from £1 to 25s., according to number of letters or numerals and quantity of ink or paste supplied. Names and addresses of manufacturers may be obtained on application to the Department of Agriculture and Stock at any time. If carefully handled, the one set of letters and numerals should be satisfactory for many years.

EARMARKING.

The branding or marking of individual animals in a herd is a matter of the greatest importance to the farmer, more particularly where the animals graze and roam over large areas and mix together

PLATE 75.

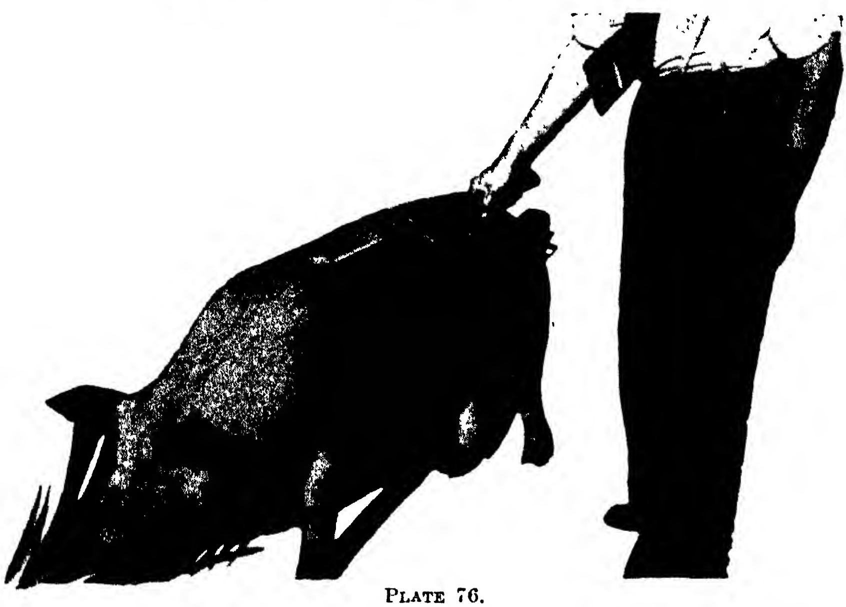


PLATE 76.

Showing operator using the body-tattoo instrument; note position approved for marking pigs.

one with the other, perhaps on properties adjacent to those on which other animals are kept.

No system of identification is considered perfect, but for identification of live animals both earmarking and ear-tattooing are practical and readily applied. It is of even greater importance that the brand or earmark be recorded in a suitable record book at the time that marking is done, otherwise the reliability of any system is weakened.

The earliest age at which an identification mark becomes necessary in pig-breeding is between one and two months of age. Where sows and litters have individual pens, two months of age or when the young pigs are weaned will suffice, or where castration of male pigs is carried out at six weeks earmarking could then be done. Every litter of pigs should be marked and correct records kept and recorded in the sow's farrowing and stock sales record book. Earmarking is probably the commonest and the most satisfactory method of marking for stud stock, but it has the disadvantage that when pigs fight or tear their ears on wire or barbed-wire fences, or where the ears are damaged in dehairing machines at the factory, this identification mark becomes somewhat unreliable. The operation of earmarking is performed with the aid of earmarking pliers, of which there are numerous designs. Earmarkers are known under trade names of Crown, Diamond, Fork, Spear, Pitchfork, Swallowtail, Thistle, Club, &c., all of which names are derived from the shape of mark made by the pliers. Allotment of earmarks and of position of marks on the ear is provided for under the Brands Act.

Pigs of all ages can be earmarked, but, as stated, it is preferable to mark while very young. Stud pigs should always be marked so that their breeding and ownership can readily be determined. Newly purchased pigs should be marked immediately they are brought into a stud to avoid confusion if they should become mixed with other stock or break fences and escape.

Earmarks are placed in different parts of the ear in accordance with position allotted when the earmark is registered. All the members of a litter should be marked with the same mark and recorded when sold or reserved for use on the farm, and all pigs sold, exchanged, or transferred should be marked with the registered earmark.

The cost of registration of an earmark for pigs under the Queensland Brands Act is 10s. Earmarking pliers for use in marking pigs cost between £1 and 30s., the price varying with design and size of instrument used. Earmarks should be registered with the Department of Agriculture and Stock, Brisbane; information on this matter can always be obtained from stock and dairy inspectors who are also inspectors under the Pig Industry Act.

In Queensland it is not compulsory to register brands or earmarks for pigs (although it is compulsory to identify the animals before sale), but if a registered earmark is used it must be placed in the position allotted to the applicant, and no other mark or brand is permitted on the same ear. Cuts in the ear representing sheep earmarks (which are used for identifying pigs) must be placed in the off or right ear of male pigs and in the near or left ear of female pigs in the position for which registration has been effected.

The earmarks must be read around each ear from the head, commencing at the front or top of the ear. All earmarks, of whatever kind, used in marking under the Brands Act must be made with pliers.

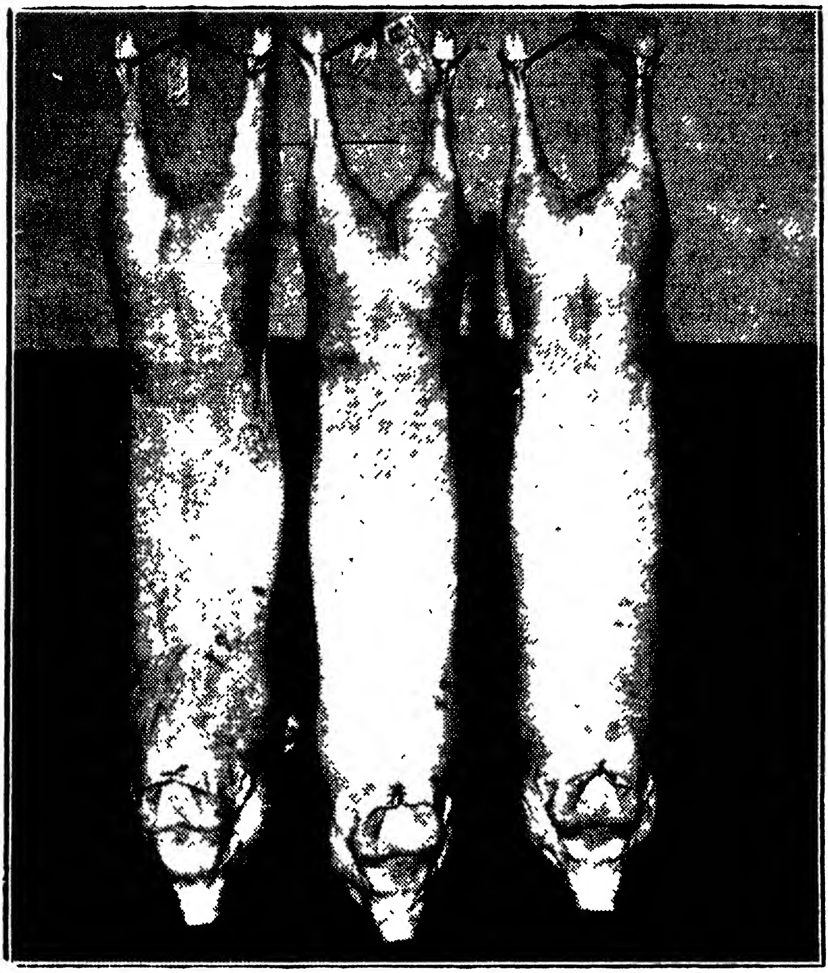


PLATE 77.

Illustrating neat, attractive body-tattoo marks appearing on prize-winning porkers at the Royal Show, Toowoomba.

A sheep (or swine) earmark is defined officially as any registered mark or cut upon the ear of sheep or upon any goats or swine. A distinctive mark may also be used in marking the ears, and such marks may be registered. A distinctive mark is defined as any mark or cut, other than a sheep mark, which an owner is empowered to make upon the ear of sheep, goats, or swine to denote their age or class and whether registered or unregistered. Distinctive marks shall be made on the near or left ear of male pigs and on the off or right ear of female pigs. No provision is made covering the shape, design, or size of distinctive

marks, and any owner may use any number of distinctive marks to denote the age or class of his pigs, but such distinctive marks shall not be made on the same ear as the registered sheep earmark. There is no charge for registration of a distinctive mark, but a registered earmark is definite legal proof of ownership in the eyes of the law in case of stealing, whereas a distinctive mark carries no such advantage. The advantage of a distinctive mark, registered or unregistered, is that as an earmark it can be used to supplement a registered earmark being used on the opposite ear to that on which the latter mark is placed; thus such marks can be used in case an animal changes ownership several times during its life.

Care should be taken in using ear pliers in marking pigs—first, to see that the pliers themselves have been properly cleansed by being washed in a disinfectant solution; secondly, to see that the ear has similarly been cleansed, and also to avoid cutting into the larger blood-vessels near the edge of and towards the back of the ear. It is wise also to avoid cutting too close to the tip of the ear, especially in stud pigs, as the shape and carriage of the ears may be disfigured. In young pigs a small cut only is necessary. A word of caution is necessary *re* earmarking pigs, for at times sow pigs, in particular, become savage and may tear the ears of other pigs—young pigs particularly—and in this way may disfigure the ears. Such sows should be separated from the herd and be finished for slaughter, as they cause unnecessary loss, damage, and confusion. It is wise also to confer with the manager of the bacon factory or pork export works before deciding on an earmark so as to avoid duplication of marks.

Stud pig breeders in particular should register an earmark if an ear tattoo has not already been registered with the Stud Pig Breeders' Society; the latter being a private organisation, registration with them would not, of course, be officially recognised in a law suit, although such tattoo-marking is not objected to by the Department. When breeding sows are being marked, the mark should be recorded with the pedigree or record of purchase or birth. Additional particulars as to age, colour, any peculiar markings, &c., should be recorded at the same time to assist in identification if necessary.

If any doubt exists, farmers should immediately communicate with the Department, when suitable advice will be promptly despatched.

Ear Tags or Buttons.

The use of ear tags or buttons on stud animals when being transported by road or rail or shipped from place to place is to avoid risk of their being lost in transit, misdelivered, or miscarried. The tags, which are made of aluminium, may be initialled on one side with name, initials, or symbol of owner, and be numbered on the other. The principal objection to the use of ear tags is that they may be lost or, in the case of theft, may be replaced by another of the same type but with different lettering. All tags are subject to being pulled or torn out or to be crushed, mutilated, or disfigured to an extent as to be almost unreliable as a means of identification. If not properly inserted, the ear tag may disfigure the ear, and may even occasion a festering wound

around the tag hole, this especially so when the hole into which the tag is placed is too small or is jagged or when an unclean pair of pliers or unclean tags or buttons are used. The method of applying the ear tag by use of combination pliers is that one portion of the instrument is used to punch a hole in the ear into which the tag fits; the other portion of the pliers is to seal the tag to prevent loss. Combination pliers for use in punching holes for and for sealing ear tags are priced at about £1. Ear tags are sold at from 12s. 6d. to 15s. per 100, according to design, initials, &c. There is no provision in Queensland for registration of ear tags or buttons.

Ear-tattooing.

Members of the Australian Stud Pig Breeders' Society who breed Large or Middle White pigs are compelled by that organisation to use the ear tattoo for identification of their stud pigs, this method having proved to be sufficiently reliable for that purpose in white-skinned breeds. As with body-tattooing, the secret of success lies in careful application of the tattoo marks.

Tattooing has the distinct advantage that it is practically indelible; it only suffers by the inefficiency of the person using the instrument, or by the ears being torn or disfigured. In the case of stud pigs, it may be necessary to retattoo the ears as required if the mark becomes too faint. Care must be taken in tattooing the ears to see that both the ear and the instrument are perfectly clean before the operation is performed, otherwise septic troubles may result and a fibrous wart growth set up around the mark. Next to cleanliness, it is important that the needle blocks be firmly placed in the jaw of the pliers, as the animal may pull back suddenly when pressure is applied. The area to be punctured should first be cleansed by wiping over with a cloth soaked in methylated spirits (this removes grease); then the marking ink or paste should be rubbed on, and, after applying the tattoos, again rub in the ink or paste into the perforations made by the needles. Where pigs are to be tattooed with the owner's initials and a stud number also, one mark should be placed in each ear. The year in which the animal was born could also be placed in the form of a letter; thus in pigs the right ear could carry the owner's initials, and the left ear would show the year symbol and number, thus: A 365—i.e., pig born in 1934, number 365. In animals with a very heavy coat of hair on the ears it may simplify marking to first clip off the hair and then clean and apply the mark.

The Secretary (Mr. A. J. Tanner) of the Aberdeen Angus Herd Book Society of Australia states that in ear-tattooing of cattle of this black-haired breed blue Indian ink is used. Provided the veins in the ear are not punctured and that ample ink is used, good results may be expected. Mr. Tanner says the chief factor in using a tattoo is to thoroughly clean the ear before making a puncture and to rub the ink well in after using the pliers. Clean the ear with methylated spirits and use a good brand of blue Indian ink.

Tattooing marks properly applied cannot easily be removed, excision of the marked tissue being necessary to ensure complete removal.

Tattooing consists in "planting" black or coloured insoluble and non-absorbable matter under the skin so that the pigment becomes held or occluded permanently within the skin. Punctures of the skin are first made and the pigment introduced into the punctures. The puncturing presents no difficulty where suitable instruments are used, these latter being simple in design and construction. It is essential to stress the necessity for quick and efficient work in tattooing and the use and application of reliable brands of ink or paste, these latter having as their base carbon, lamp-black, and other indelible materials in solution or otherwise.

Ear-tattooing instruments complete with letters, numerals, ink, or paste retail at between 30s. and £2 2s., and may be secured from veterinary instrument manufacturers. The smaller size manufactured are best suited for marking young pigs.

Hair-clip Marking.

Marking pigs by means of clipping away the hair on any particular portion of the body is at best merely a temporary sale mark; so also is paint-marking and cutting of hair on tail (referred to as bang-tail). Paint-marks are useful once pigs are penned at an auction sale in order to differentiate between the animals and for reference purposes in sale of the stock, but they cannot be regarded as an approved method of branding under the Pig Industry Act. Both systems are useful in the hands of honest people, but a very strong objection to their use lies in the fact that an unscrupulous person could readily disfigure the mark and thus cause confusion and annoyance.

The objective of the Regulations is to pave the way for reliable methods of identification; hence as paint-marks, hair-clipping, and banging tails are not reliable as a permanent method of identification, they cannot be recommended. They would not be accepted as distinctive marks under the Brands Act, but if pigs are so marked at sale time the auctioneer should keep a strict record of such as provided for in section 11, referred to on page 161.

IDENTIFICATION OF GRADED CARCASSES

The Queensland Pig Industry Act provides for identification of all carcasses with grade stamps of a specified shape and size and of different colours according to how such carcasses are graded; such grade marks apply to all pork and bacon pig carcasses graded for sale within the Commonwealth. Grade stamp tags are attached to all carcasses intended for export as provided for under the *Commerce (Trade Descriptions) Acts,* 1905 *to* 1930.

Full particulars regarding these marks may be obtained upon application, in the case of the former, from the Department of Agriculture and Stock, William street, Brisbane, and for the export trade from the Chief Veterinary Officer, Department of Commerce, Q.T.C. Buildings, Petrie Bight, Brisbane.

The marking applied to bacon pig and pork pig carcasses for export consists of the word "Empire" in block letters, stamped on the hind leg, loin, fore-end (on shoulder), and hand and spring (foreleg).

Summarising these notes on identification, it may be said that it is advantageous in the interests of all concerned that all live pigs be branded by the vendor prior to disposal of the animals. It is essential that whatever mark is used it be used efficiently so that the animals are clearly and evenly branded. The next most important step is to advise the agent, dealer, buyer, or factory manager of the exact number, age, and condition of pigs, the marks given to each animal, and any other description that may be necessary to facilitate identification, and to be sure that the person concerned receives this information in ample time beforehand to enable identification to be carried out expeditiously on arrival of the animals.

POINTS IN PURCHASING STORE PIGS.

The following suggestions are offered to those who intend purchasing, or who regularly make a practice of purchasing, store pigs will not be out of place, seeing that a number of instances have been recorded within recent months in which unsatisfactory results have followed the purchases and money has been lost in the transactions. It is suggested that inexperienced persons who set out to purchase pigs for finishing for market should endeavour, wherever possible, to secure pigs not less than fourteen or sixteen weeks old, for it is disastrous buying pigs six weeks old or too young for weaning and expecting them to make progress or to prove satisfactory and economical, especially as these very young unweaned pigs often cost more at auction than those carrying more size and age. There is a wise old saying, "Never buy a pig in a poke," which literally means never buy a pig of whose breeding or development you know nothing. Fortunately, under the conditions on which pigs are offered for sale at public auction in this State, the buyer's name and postal address must be announced by the auctioneer before the pigs are offered for sale, but, though this is a valuable safeguard against the distribution of disease-carrying stock, it is not everything, and the buyers should certainly know something of the conditions under which the pigs intended to be offered for sale have been developed, the foods used in their production, the breeding, age, and any other information available. The purchase of store pigs from breeders with a well-known good reputation is usually a safe proposition, and it would be preferable to purchase only from well-known breeders if success is expected in the efforts to eradicate and/or trace disease to its source of origin. Lice, worms, and other parasites that infest the pigs are readily conveyed from one animal to another, and there is some evidence that they are responsible for the spread of disease.

When selecting pigs from a litter, secure the strongest and best; they will repay the extra cost of two or three shillings per head and prove to be good buying; the same may be said of purchasing stock that are already making good progress. Never buy pigs manifestly unhealthy and with abscess formation, ruptures, piles, open or suppurating wounds. It is wise, where possible, to have the stock or dairy inspector make an inspection of the pigs it is intended to purchase before the sale commences or the deal is completed, in order to have an additional safeguard. It is wise to avoid purchasing pigs which are in poor, emaciated condition and/or are stunted in growth and which give evidence of unthriftiness. Avoid purchasing where the pigs are crowded together in a small and possibly a badly lighted pen.—E. J. SHELTON, Senior Instructor in Pig Raising.

Some Notes on Silage

WITH SPECIAL REFERENCE TO STACKS.

By H. C. QUODLING.

SILAGE stacks suffer deterioration if an attempt is made to hold them over from season to season. Best results are obtained by building them at the latter end of Summer, in the flush season, and using the fodder in the Winter or Early Spring.

It is evident that the dairymen and sheep farmers of our agricultural districts will never come into their own until their stock can be satisfactorily carried through the winters and over any dry spells which may occur.

Increased land values, and a general all-round rise in the cost of living and, similarly, in that of production, may be cited as reasons for keeping stock in condition and in a state of efficient productivity consistent with ruling conditions.

Cultivated crops and artificial pastures are doing much in effect, but seasonable shortcomings can only be met by looking to the contents of the barn for dry feed, and to the silo or stack; in this latter instance is to be found a palatable, ready-to-hand form of succulent fodder, which should be provided on every farm where live stock are kept for profit. Many arguments may be advanced in favour of silage, but it is felt these are not required where practical thinking men are concerned, whose chief inquiry is for reasons to prove to their intelligence that, by adopting certain methods of conserving fodder, they are to get a *quid pro quo* for their outlay, be it in labour or in kind.

Queensland's rich soils and generous summer rainfall are responsible for crop growths not attainable in the more temperate parts of the Commonwealth; and when such tangible results are to be so easily secured from Nature's garden, it is certain that a stockowner's desiderata in the matter of a supply of the right class of fodder will be readily attained by an extension of the self-help methods common to all who have to wrest a living from the land.

Inquiries through the medium of the Department on silo construction and its attendant features are sufficiently numerous to indicate that interest has been aroused in the subject of fodder conservation.

It is not proposed here to dilate on the merits of different silos or advocate possibly out-of-reach methods likely to act as a deterrent on account of an initial outlay of capital, but rather to deal only with a section of the subject with simple and economic features designed to meet local and existing conditions.

A number of silage demonstrations have been carried out by Departmental officers, and, although evidence in a general sense is not wanting to show the possibilities of fodder conservation, it is more fitting that the words of those farmers who have followed out the methods advocated may be made known to others who contemplate erecting silos or stacks.

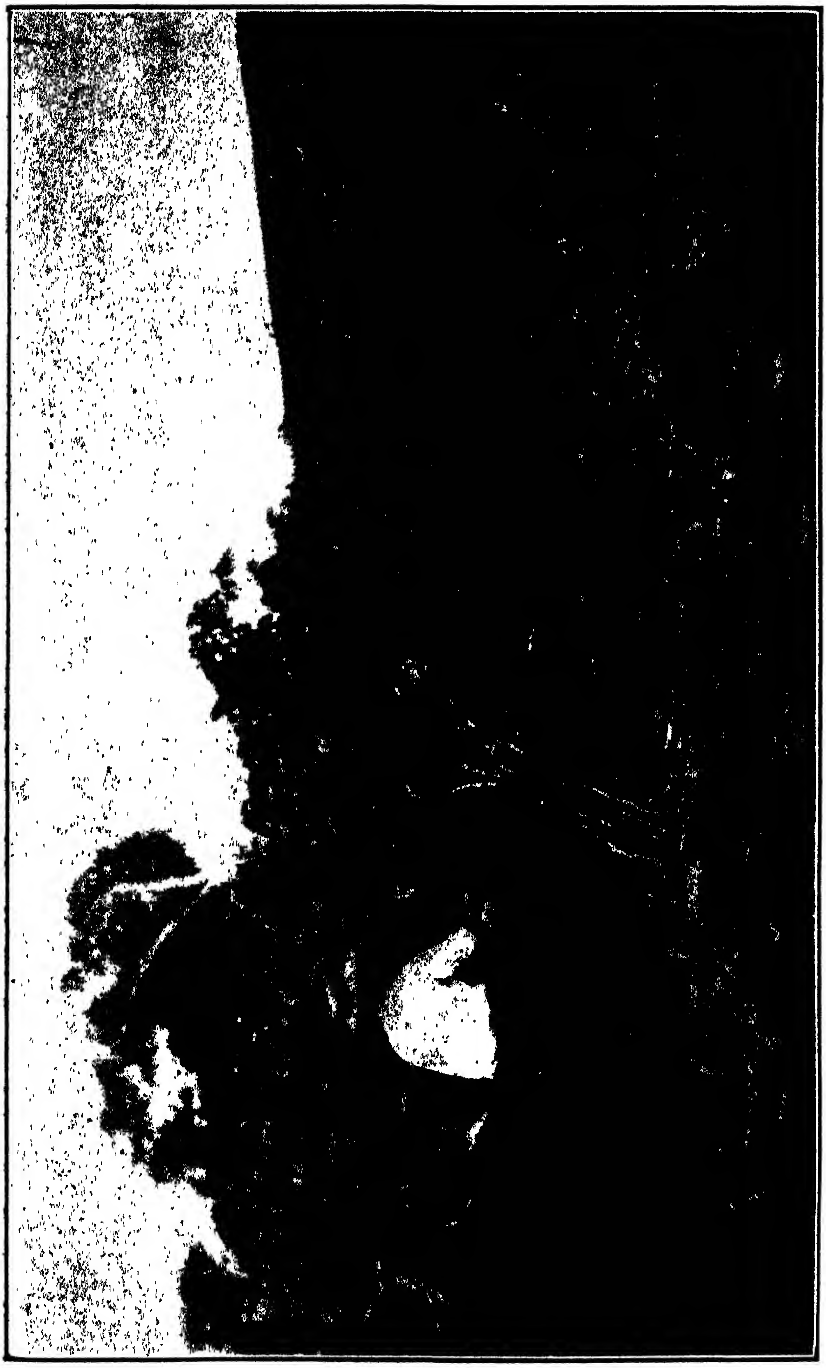


PLATE 78.

Sledge cutter at work in an immature crop, showing manner in which stalks are laid down by means of guide rod.

Extracts from their manuscripts are as follows:—

"The stacking of maize was finished on Saturday, 3rd May. All are well pleased with the way the lever worked. It was rigged up so that the bundles were slung right over the side into the middle of the stack, and the earth for weighting (6 tons) was put up in the same way. We started feeding the silage to the cows straight away, and they took to it greedily, and are showing an increase already, so we are reaping the benefit of stored fodder."

"The ensilage is very good, and the cows would tear the stack of maize down to get at it."

"I think the method of stacking all that can be desired—that is, when one cannot afford to build a silo. It opens up splendidly, in my opinion, with very little waste, and stock eat it readily, notwithstanding that we had to cut the crop (maize and sorghum) on the green side, on account of being afraid of frost. The cows chase the dray as soon as they see it, and milk well on the fodder."

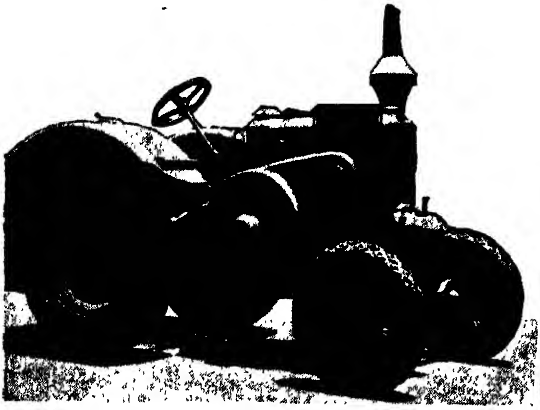
"It has been the means of storing from 100 to 160 tons of silage (sorghum and maize) which might otherwise have been spoilt."

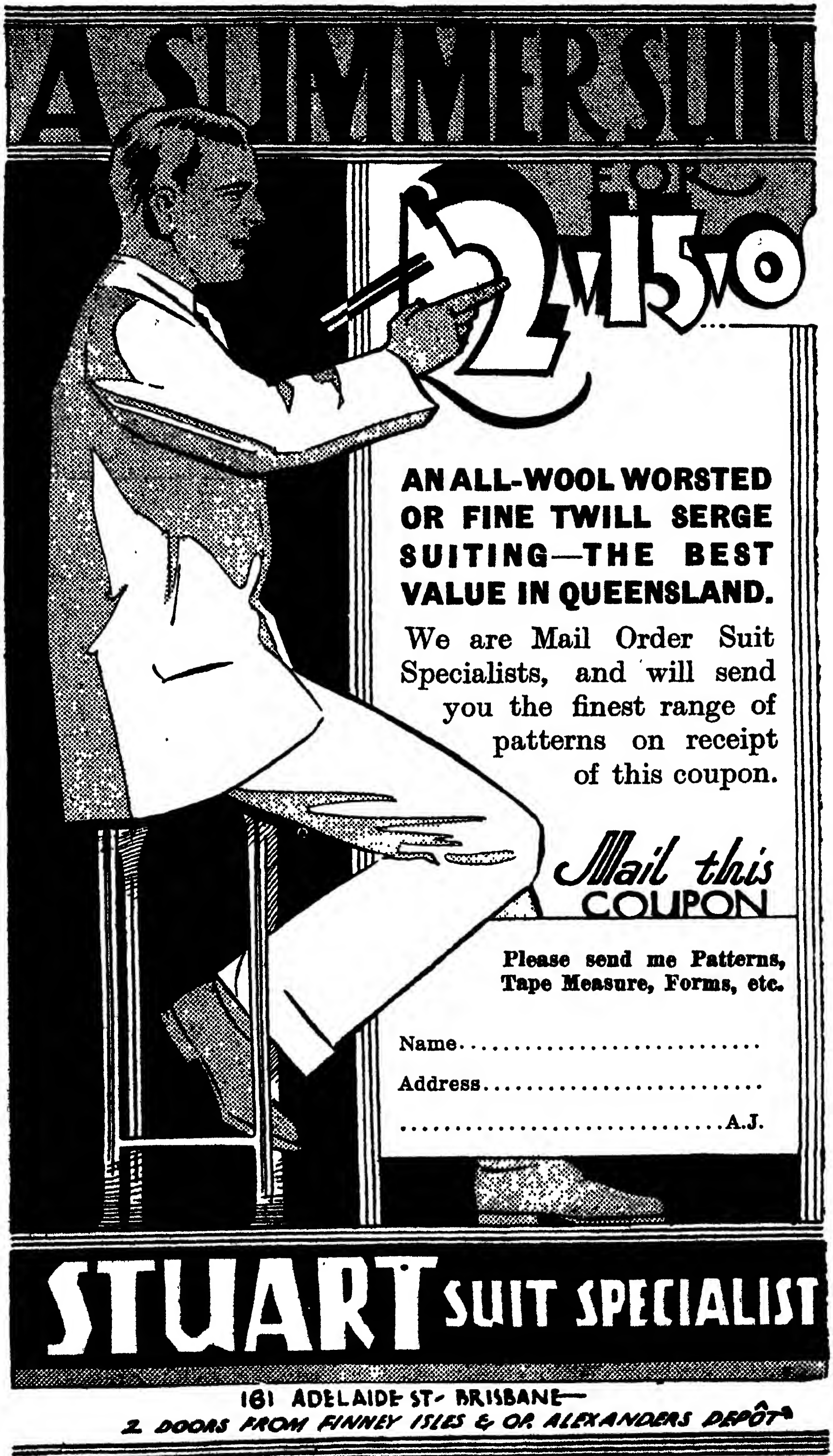
"In 7 weeks after stacking, I commenced to use the silage, and came to the conclusion, in a very short time, that I had a valuable asset from a feeding point of view. I fed in boxes at the rate of 40 lb. per diem per cow, and cows which had been in milk from 4 to 8 months increased their flow fully 50 per cent. Cows which have newly freshened keep up their normal first flow unceasingly, and that during winter. It is better to feed after milking than before, and I am at present obtaining an A1 grade from the factory for my cream. . . . am well satisfied with the experiment, and have come down to the bed-rock conclusion that, as soon as funds will permit, I will erect a silo, as, after some years' experience, it has been found that one cannot 'dairy' in the winter on artificial grasses with profit, and ensilage appears to be a *par excellence* winter ration. The sorghum ensilage is chaffed with a small percentage of sugar-cane, in order to carry it through the chaffcutter, as it is not the best stuff to chaff by itself."

"Maize and sorghum were sown in alternate rows. Owing to dry weather, there was only a light crop; a reaper and binder was used to cut the crop, and the carting was done with rough sledges, each drawn by one horse; stacking began on 26th March, and the stack was opened in the second week in July. After cutting down the first bench of about 9 in. as waste, it was found to be in good condition. The cows did not take to it at first, but the calves ate it well. One by one, however, the cows began to eat it, and now nearly all of them are feeding on it, some of them taking it greedily."

"We are milking 22 cows, and it is a significant fact that a pronounced increase in the milk yield has followed. As they have no other change of food, I can only attribute this increase to the silage. As the feed* in our paddocks is now becoming

* Principally Rhodes grass.





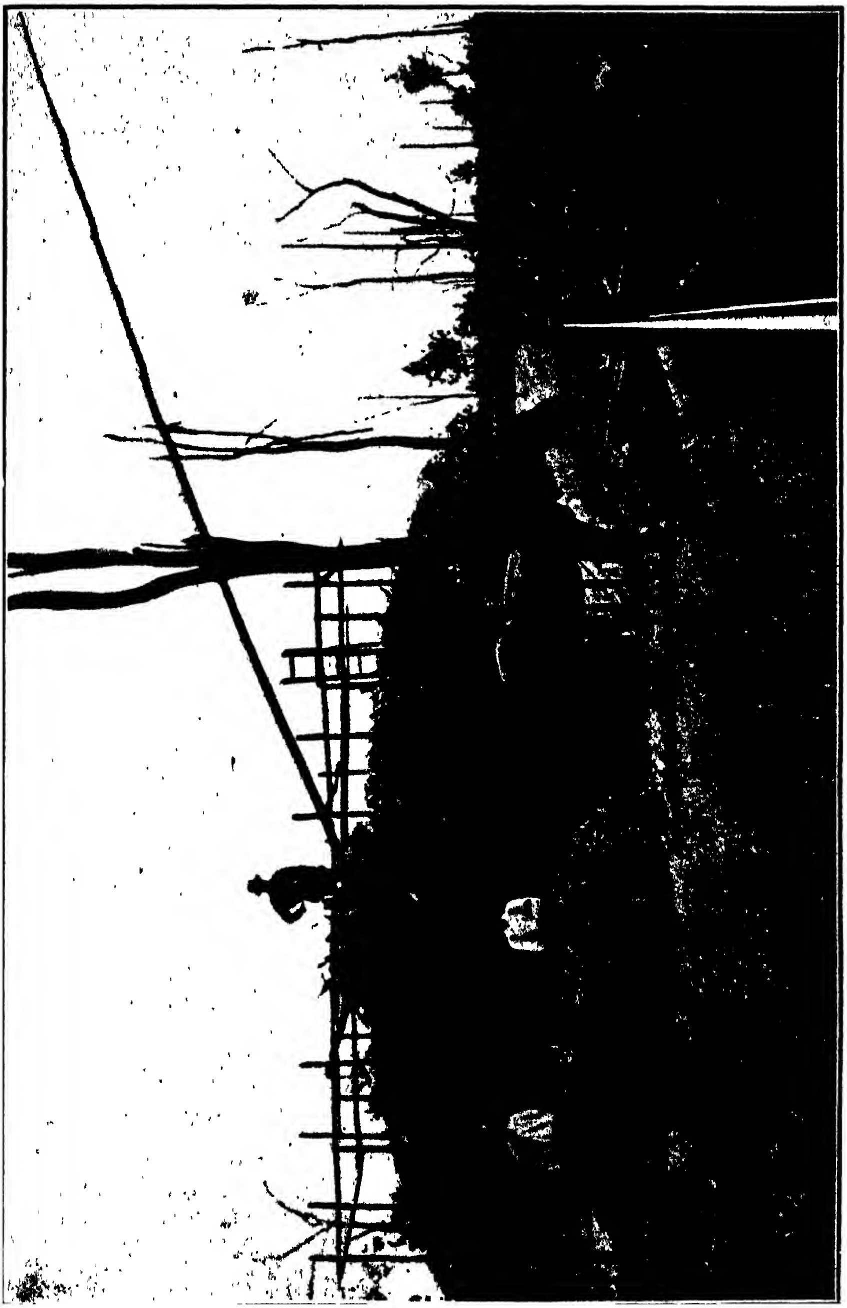


Plate 79.—Stack in course of construction, showing projecting "untrimmed ends," also "whip" hoist attached by means of a chain to a dead tree.

poor, and there is little prospect of its improving for a month or so, I view the silo, with its stock of compressed fodder, with great satisfaction, as I believe it will tide our dairy herd over the critical period of the year. This is its great value, and I more than ever see the wisdom of having laid by this winter store of food. During the coming summer I shall build a much larger stack on the same pattern, and hope to put by 70 or 80 tons of maize and sorghum for the winter. I assure you of my complete satisfaction at the result of your experiment on my farm."

"Am very well satisfied with the experiment and will build a considerably larger stack next year, all being well. I am not using up to the full amount, but what I am is keeping my cream and milk supply up to its regular amount; other hay, such as lucerne, oaten, and, at times, bush hay is mixed with it. My cows, when it was first offered to them, did not seem to care about eating it, but now they have got used to it, they nearly go mad to get at their feed."

"I opened one end of the stack to see what it was like, and am glad to say it is first class. I am perfectly satisfied with the experiment, and intend going in more for it in the future. When stacking was finished I put in 18 inches of earth on top, sloping from centre of stack to the ends; then five wires across the top and hung very heavy logs to them; two persons who have examined the stack, and know stack ensilage in other parts, state that it is in excellent condition."

Instances are not uncommon where maize crops have made good growth up to a certain stage and then failed to set grain through the dry weather. In the Southern Burnett part of the 1916 crop was affected in this way. Altogether about 50 stacks were erected in this locality alone, some ranging to 150 tons capacity.

Again in 1919 officers of this Department held demonstrations in silage making, and travelled through several districts with the object of assisting and advising farmers who were determined to turn their wilted crops to good account for fodder purposes, upwards of 12,000 tons of fodder being conserved, which assisted in saving the lives of many valuable dairy stock.

Inquiries made since show that the silage was found to be or great value and of satisfactory quality.

Points to be Observed.

Maize is one of the best and most satisfactory crops to grow, but any ordinary crop which is commonly used for green fodder or hay will make good silage.

The amount of labour involved in the handling of bulky green fodders may be considerably reduced when machinery is available for cutting and for binding into sheaves.

PLATE 80.
Stack silage demonstration at a dairy inspectors' special silage instructional course.

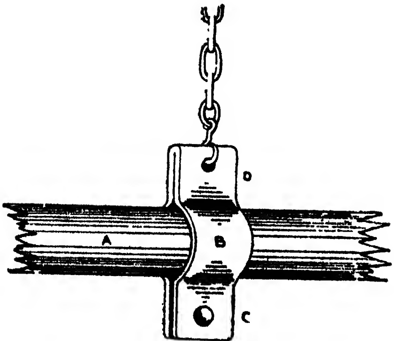


PLATE 81.

CLAMP FOR SUSPENDING WHIP.
(a) Whip spar.
(b) Clamp made from an old tyre 4" × ⅝".
(c) Clamping bolt.
(d) Clamp welded and bored for hook.

Where large quantities of fodder are to be handled, a mechanical hoist is required for the higher levels of the stack. For hand work the "whip" type is preferable. In connection with the erection of a "whip" it is necessary that some means be adopted to prevent the spar slipping at the point of suspension, and the clamp shown in the sketch is an effective and useful means of preventing this. A substitute which is also very effective may be obtained by using an ordinary chain strong enough for the purpose and forming a "clove" hitch at the point of suspension, afterwards nailing on two small hardwood blocks to the "whip" spar, one above and one below the position of the chain on the spar; or drive in two strong iron staples. For horse power a yardarm and spar, with suitable blocks and the necessary wire rope and clutching dogs, make an effective combination, or pulleys and tackling may be substituted.

Fodder stacked in the open is subjected to an atmospheric pressure of 15 lb. to the square inch; and the stacker's chief concern should be to check combustion as much as possible—*i.e.*, by preventing the access of air to the mass.

Waste is unavoidable at ends and sides and is to be expected. A 25 per cent. depreciation will take place under indifferent conditions of stacking. The loss under good conditions should not be more than 12 per cent., provided attention is given to salient features and to working detail.

Coarse or fairly mature fodders require a greater dead weight pressure, and do not compact as readily as finer and more succulent plants.

Emphasis is placed on the fact that the success of a silage stack depends very largely on the consolidation of the contained fodder so as to exclude air, which, if admitted, would cause rapid deterioration.

"Use plenty of weight when stack is completed."

Variations in temperature are factors in the chemical and biological changes which take place in the process of turning a mass of green fodder into silage, but it is unnecessary to go to any more trouble than to check the processes of oxidation and fermentation which are responsible for high and abnormal temperatures. When undue heating takes place during the process of stacking, the temperature of the mass is readily reduced by putting on more green fodder, and by throwing a series of wires across the stack and hanging heavy logs to them; this may be done at the close of each day's operations. Where a limited number of animals are kept, long and narrow stacks are preferable, as the lesser superficial surface is exposed at the ends when feeding out. The higher the stack, in keeping with facilities for hoisting, the better.

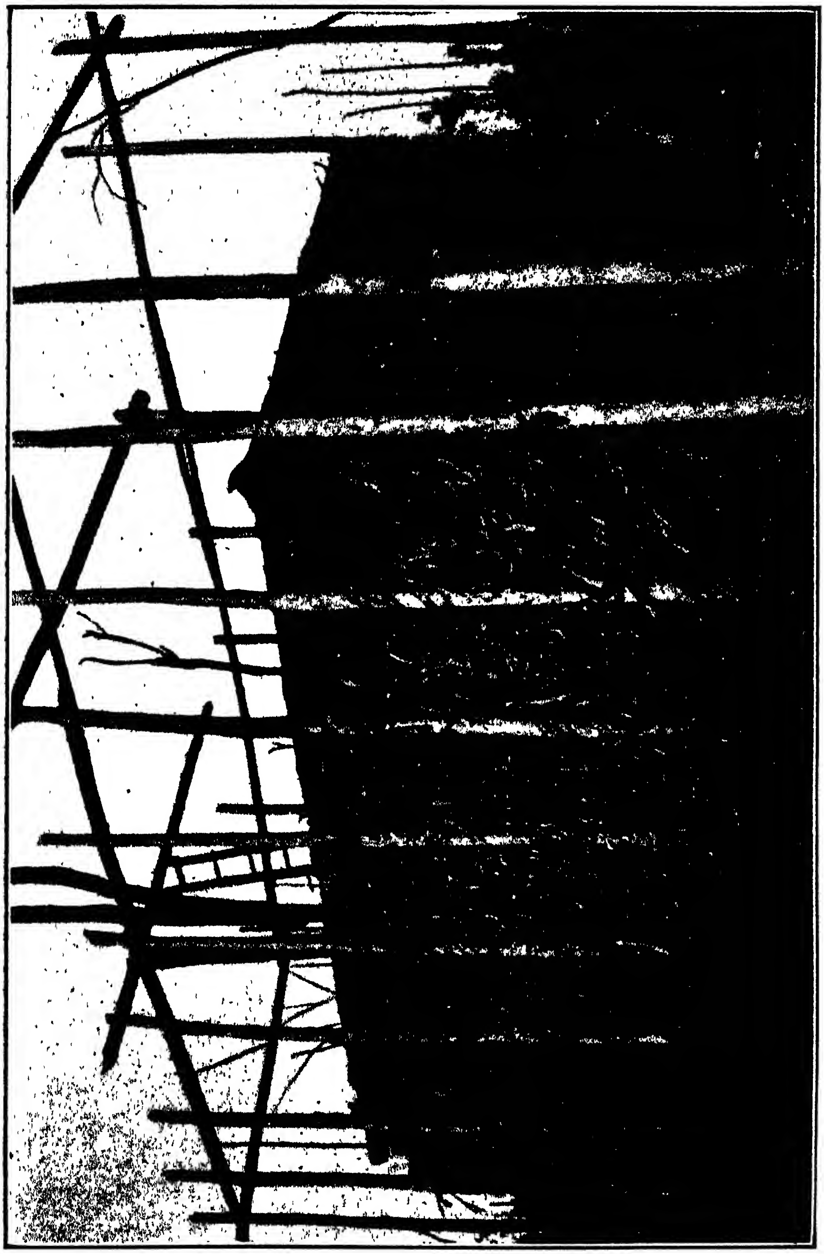


Plate 82.—Framework and "trimmed" stack, showing an extra pair of uprights at each end, to which a crosspiece is attached for supporting the ends of the fodder when stacking.

It takes from 50 to 56 cubic feet of consolidated silage to make a ton. Crop yields may be computed and the dimensions of frame work arrived at. Abnormal settlement is to be expected, and weighted stacks usually settle down finally to a little less than two-thirds of their original height.

Heavy crops like maize and sorghums should be evenly sown in regularly spaced drills to facilitate harvesting by machines; the production of a medium thickness of stalk with a maximum of leaf should be aimed at.

Immature crops produce a less palatable and inferior article from a feeding standpoint. Where maize is to be chaffed into a silo, the crop may be left standing until the plants acquire the most nutriment—*i.e.*, when the grain attains the soft dough stage.

For stacking, it is an advantage to cut when the grain is in the "milk" stage before the stalks become too firm. Sorghum, Japanese millet, panicum, &c., should be cut when the seed heads or panicles are well formed and the grain about half developed.

The Stack.—The site should be chosen on a naturally drained piece of ground, and handy for feeding out to the stock, and yet as close to the crop as it is possible to get it.

When computing prospective contents of stacks several factors require to be taken into consideration, amongst which are—

- Material used for silage;
- Condition of crop at time of cutting;
- And the amount of dead weight to be subsequently added to consolidate the stack.

Sorghums and millets are inclined to pack tightly and afford, on this account, a heavier average weight to the cubic foot than maize.

The following table of contents of various sized stacks may be taken as approximate; sorghums and millets, as previously mentioned, will weigh somewhat heavier:—

(At rate of 54 cubic feet to ton.)

SIZE OF PERMANENT STACK AFTER ENDS ARE TRIMMED.

Feet.		Tons.
12 × 9 × 15	=	30·0
12 × 10 × 15	=	33·3
15 × 9 × 15	=	37·5
15 × 11 × 15	=	45·8
18 × 10 × 15	=	50·0
18 × 12 × 15	=	60·0
21 × 12 × 15	=	70·0
21 × 14 × 15	=	81·6

In setting out a frame for a stack 18 ft. by 10 ft., ten poles on each side would be required, arranged as follows:—

Poles require to be 17 ft. 6 in. in length, and about 5 or 6 in. in diameter at butts. Sink the holes 20 to 24 in. in the ground. Top plates and tie beams should be securely twitched on close to the top of uprights, to make the framework rigid.

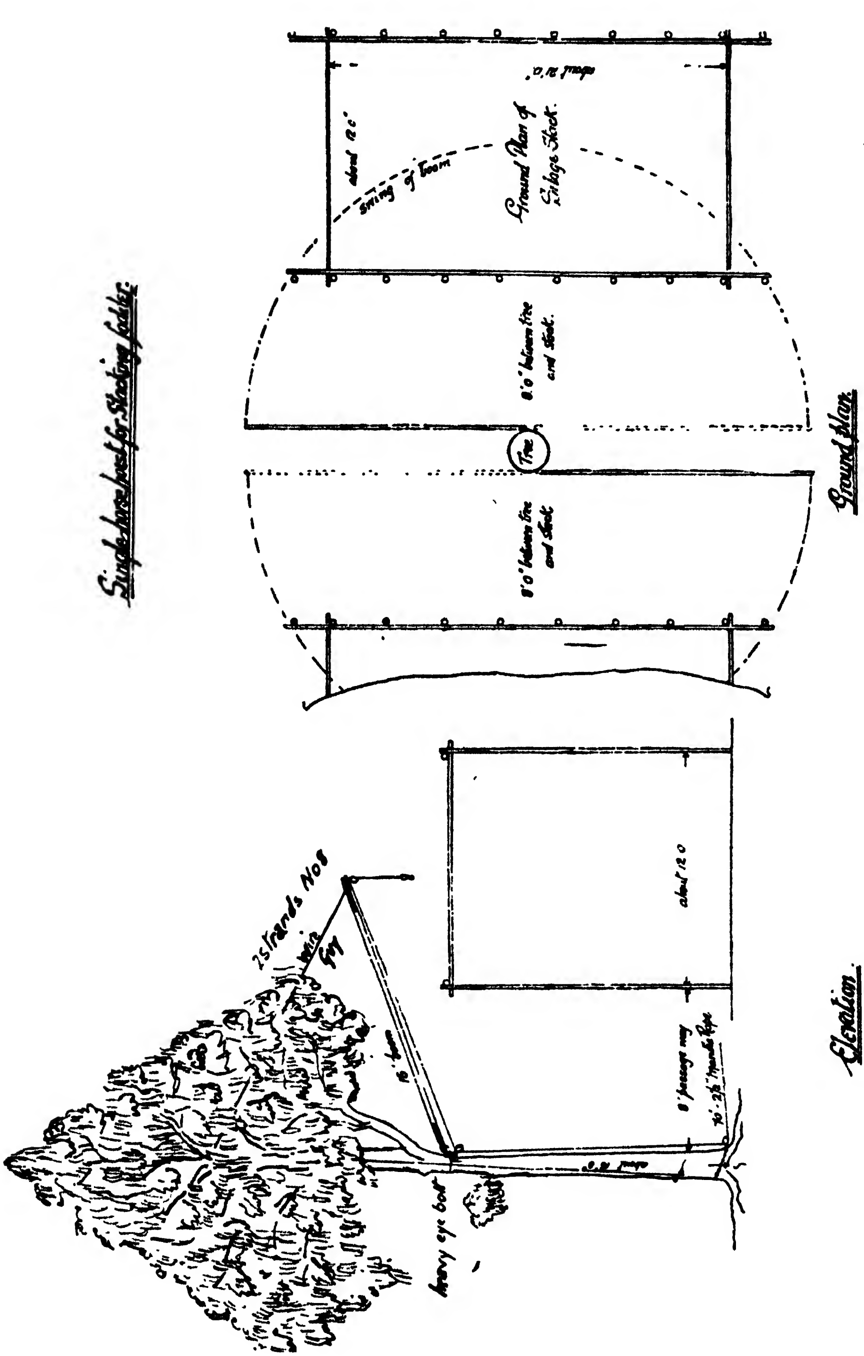

Single horse hoist for Stacking fodder.
Ground Plan of Silage Stack.
swing of boom
Tree
8'0" between tree and stack.
Ground Plan.
2 Strands No 8 wire Guy
heavy eye bolt
Elevation.

PLATE 83.

When long-stalked crops are to be stacked, a fair average distance apart to place the uprights is 3 ft.; for shorter-growing crops this distance should be lessened accordingly.

Construct a framework of bush poles similar in design to those in accompanying illustrations, the dimensions of which and distances between the uprights being arranged so as to accommodate the amount and class of fodder on hand. Plant the poles firmly in the ground; attach the top plates with a wire twitch at a height of, say, 15 ft. from the ground. Brace across at ends and at centre, taking care that the pair of poles intended for carrying the central brace or tie are carried up high enough to give head room for the stacker when moving about on the upper levels of the stack.

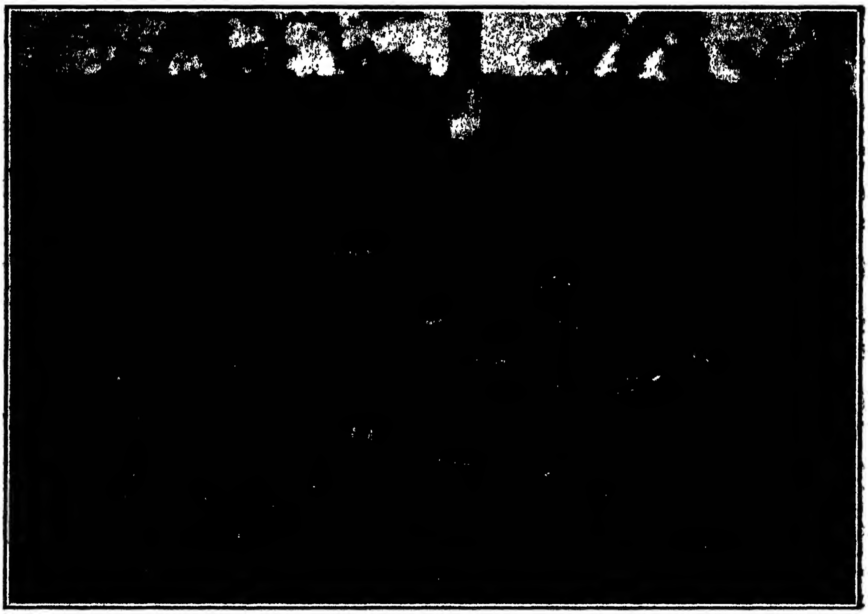


PLATE 84.

Sledge cutter 5 feet 6 inches long by 2 feet 4 inches wide, showing projecting scythe blade (passed through mortice), also angle to set guide rod.

The uprights may be spaced at a distance apart of 3 ft. along the sides for maize and sorghums, and a minimum of 2 ft. for crops like barley and panicum. An extra pair of uprights should be put in at each end of the framework and braced securely; a crosspiece is attached to these to carry the projecting ends of the fodder until such time as they are trimmed off, the crosspiece subsequently being moved higher up to serve a similar purpose.

The position of that portion of the top plate, proving to be in the way for the "travel" of the whip, may require to be altered temporarily, or brought down to a lower level, and afterwards raised as stacking progresses.

The framework is of no value once the stack has settled down.

The "corn binder" is the most approved machine for cutting and binding maize and similar strong-growing crops into sheaves.

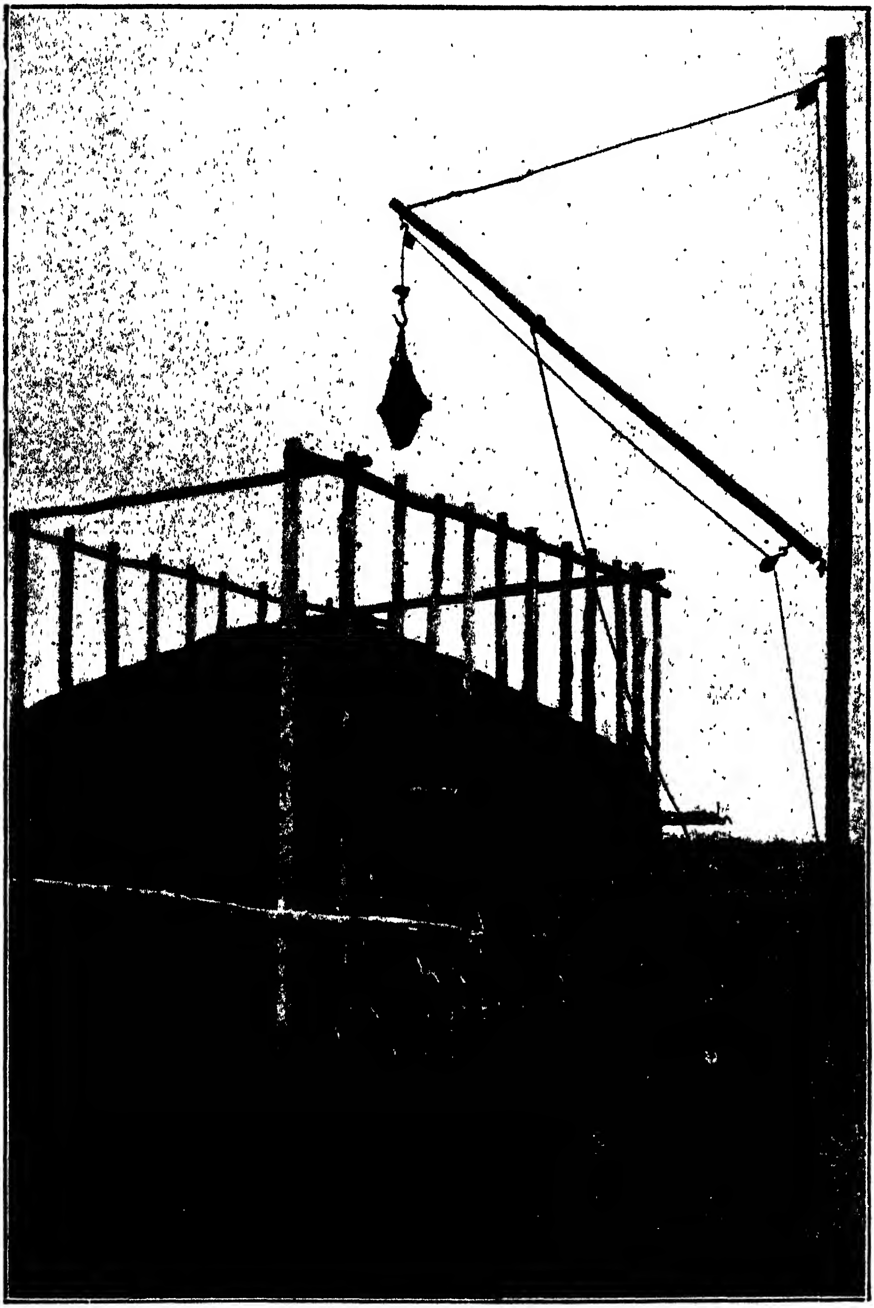


Plate 85.
Stack built under the supervision of the Department of Agriculture and Stock.

Lighter classes of crops may be handled to advantage with an ordinary "reaper and binder" or back-delivery "reaper."

The secret of handling heavy crops is to keep the stalks parallel in the bundles, whether cut by machine or by hand.

Maize and sorghums, if standing fairly upright in the drills, may be cut with a sledge cutter, which is simply a narrow sledge, set on a pair of runners and decked with 6 in. by 1 in. boards—a scythe blade is attached at one side at an angle adapted for slicing off the stalks, and should be braced in such a way as not to interfere with the cutting. Fix a guide rod to lay the plants down evenly in a regular swarth. They can then be kept fairly parallel when gathering them into bundles. For hand work an ordinary cane knife is very suitable.

Sledges are the handiest for short hauling distances; when the "hoist" is used, the fodder should be loaded on to suitably sized rope slings to be ready for lifting off.

Before commencing to stack, open out a shallow drain around the outside of framework, and use the soil for levelling off any surface inequalities within it. Place a layer of about 6 in. of waste green grass on the ground. Start stacking on this and KEEP ALL THE STACKS LAID THE ONE WAY. Transverse layers admit air far too much into the stack. Place the tassel end of the maize at least 3 ft. 6 in. over at both ends of the stack. When placing down the next layer, reverse the order, and if the fodder is at all on the dry side, damp it with water, and take the precaution also of placing some of the leafy portions of the fodder over any bare patches which may be present. When a height of about 3 ft. has been reached, lay down a board flush with a pair of uprights which are to form the true ends of the stack, and trim off the projecting ends of the fodder. Before starting to stack again, move the crosspieces up the outside pair of uprights, in order to support the ends of the second tier of fodder. Repeat the process of stacking and trimming off as previously noted.

A minimum thickness of not less than 2 ft. 6 in. of fodder should be stacked each day.

Keep a good camber in the centre of the stack, as heating soon causes abnormal settling there. Use judgment when binding the layers back, so as not to have any bumpy joints where the laps come. Care should be exercised in placing fairly straight stalks along the sides, and these should be well firmed down between each pair of poles, the laps being carefully watched to prevent any spaces being left.

The trimming of the ends, which should be done with a plain hay knife, ensures a consolidated section exposed to atmospheric influences, but the carefully concealed over-lapping of the stalks at the sides is essential for keeping the air from penetrating the mass; the more the air is kept out, the smaller the percentage of loss.

Settling takes place rapidly as soon as the mass begins to heat.

As previously noted, wires, heavily weighted, should be thrown over the stack at night time, attention being paid to the placing of separate wires within a few inches of each end of the stack where it is trimmed off. Remove wires and weights before continuing to stack next morning. Allow a big margin for settling. When finished to a full camber, spread

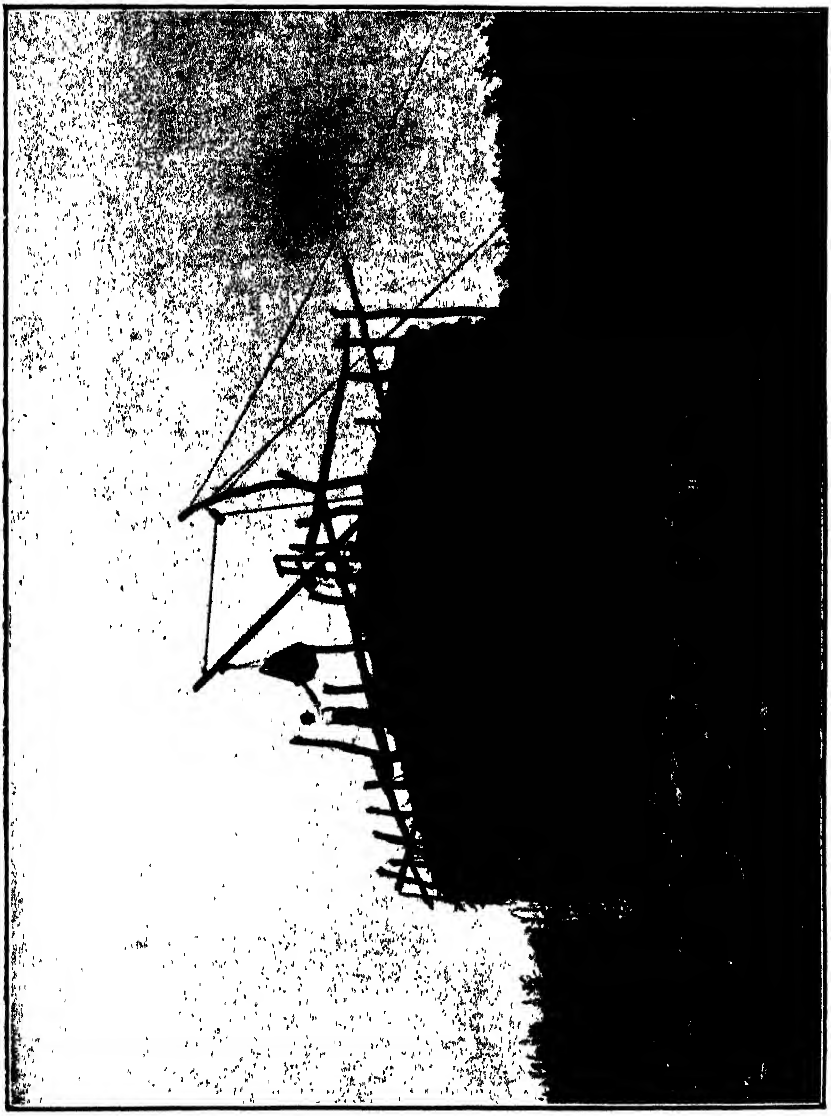


Plate 86.

A stack nearing completion. Weighting material (stones) being hoisted by a horse prior to the topping off of stack with bush hay.

a layer of several inches of soft green grass or other close-textured weeds immediately on top of the silage; water this well. A framework of logs should then be placed evenly on top of the completed stack; these should be halved at the ends in a similar manner to the ground plates of an ordinary building. The weighting material is evenly disposed over the whole surface of the stack, the logs keeping the loose soil, or any other kind of material used to supply the weight, in its place. The layer of soil must average about 12 in. in thickness. The stack should then be topped off with bush hay or other waterproof material. A neat finish should be given to the roof, which requires to be built to a full eave, and all loose straws raked off. Wires are then placed across the top, and well weighted in order to keep them in position.

Other Weighting Material.

Stones, where they are easily procurable, may be substituted for soil, and the spaces between the stones can then be filled, if so desired, by soil.

Permanent weighting material is readily prepared by filling kerosene or benzine tins with concrete or with cement and sand compo., twisted wire handles being inserted in the mixture before setting takes place. This latter system economises labour where silage-making becomes a regular institution on the farm.

Although it is an advantage to allow the stack several weeks in which to settle down, and afford the necessary time which is required to effect the metamorphosis "from green fodder to silage," it may be opened at once should the fodder be then required. All that is necessary is to throw off some soil at the extreme end of the stack and cut down a narrow bench from top to bottom. The covering of soil on top keeps the rest safe from the weather.

Stacks are not meant to last more than a few months on account of depreciation from exposure to the weather, but instances have occurred where they have been kept for years, and then used to advantage. (Silage will keep, however, for many years in a well-built silo, and the depreciation is infinitesimal.)

Better results are obtained by chaffing the silage before use, and its passage through the chaffcutter is facilitated by using any strong-stalked fodder to assist in carrying it through.

A handy method to provide for feeding out to animals is to make receptacles, to act as makeshift troughing, out of ordinary 4-bushel sacks strung on No. 8 wires. Pairs of round uprights are put in at opposite ends of a line of fencing, the character, length, and gauge of which are designed to carry the sacks strung out on or sewn at each side to No. 8 fencing wires, running parallel to one another and placed at such a width apart as to form the suspended sacks into receptacles of the desired depth. Crosspieces may be nailed to a series of pairs of intermediate posts, and the holes for the wires bored through these to suit. The same class of feeding receptacles may be used for sheep, but should be made narrower and kept at a convenient height from the ground for feeding.

Brief Notes on Silage as Food.

"Silage is not a perfect food, and must be supplemented by other fodders and concentrates where full milk production is looked for."

Plants like maize, sorghum, and similar fodders, which contain a relatively high proportion of carbohydrates (starch, sugars, &c.) used in an animal's system for maintaining bodily heat, do not form perfect foods until more protein or flesh-forming substances are added in proportion, recognised as suitable in the aggregate, for making up a balanced ration. Leguminous plants—lucerne, cowpeas, field peas, &c.—are designed by Nature to supply this deficiency. In practice, it is found that the succulence of silage assists in the assimiliation by animals of dry foods and cured fodders.

A good combination of food for one day, sufficient for the support of one cow of 1,000 lb. weight, when yielding up to 3 gallons of milk, is arrived at by feeding 45 lb. of maize silage and 15 lb. of lucerne as hay or chaff; another ration, equally suitable, but not quite so rich, may be made up by using 40 lb. of the former and 20 lb. of cowpea chaff. The nutritive ratios of the fodders noted work out at 1 : 4·73 and 1 : 6·16, respectively. Analyses of fodders and silage present many variations. A general average per head per day for the support of a number of milch cows, when other feed is scarce, may be set down at 40 lb. of maize silage and 15 lb. of lucerne chaff. With this as a basis, the feeder is in a position to use his intuition and judgment in dealing with the individuality of animals.

MILLET HARVESTING.

Judgment must be exercised in deciding the time at which to cut millet for forage, and for all purposes care must be taken to harvest at the correct period. This should be the stage at which the crop is richest in nutrients, and most palatable and digestible.

When the majority of the seedheads or panicles have formed in the green pendulous stage is the correct time to cut for green fodder. It is better to err on the side of greenness, though millet cut too green has a laxative effect on stock; if too ripe there is a possibility of the feed becoming unpalatable.

The green crop contains much moisture in both stalks and foliage, and in consequence takes longer to cure than ordinary wheaten hay. If the crop is intended for silage, it may stand a little longer after heading out, but it must be cut prior to ripening.

As green feed, hay or silage, millet is very useful for dairy cattle, sheep, and young stock. For grazing it has been found to be excellent for sheep and cattle. Millets have no poisonous qualities, like sorghum, and may be fed when quite young. It is best, however, not to start feeding off until the crop has attained a height of at least 6 inches. After it has been well eaten down the stock should be removed until another growth is made. With suitable weather conditions, this should be only a matter of days, as the growth is rapid.

Japanese is by far the best variety for feeding off.

There is no more useful crop than millet as a quick-growing source of feed. It may be sown up to the end of February.—A. and P. Notes, N.S.W. Dept. Agric.

By H. W. BALL, Assistant Experimentalist.

IN view of the numerous inquiries reaching the Department of Agriculture dealing with what is commonly known as sorghum poisoning, it is evident that considerable confusion exists among the farming community as to those plants most liable to cause fatalities among stock.

For instance, millets are often mentioned, although the millets, including those varieties known as Setaria and White Panicum, do not contain any poisonous substance and may be grazed with safety at any stage of their growth. It is the sorghums which contain a hydrocyanic acid-yielding glucoside which is chiefly concentrated in the stalks during the early stages of growth. This HCN persists in decreasing quantities as the plant grows, entirely disappearing by the time maturity is reached. Stock should therefore not be allowed access to immature sorghum, especially if wilted through dry weather. Second growth and immature frosted material is also dangerous. Sorghums are most palatable and nutritious when the grain is in the milky stage, which is therefore the most opportune period at which to cut for silage or fodder purposes.

Sudan grass, which is classified botanically as a sorghum, being *Sorghum sudanense,* contains approximately one-quarter as much HCN as sorghum at corresponding periods of growth. Farmers should therefore be cautious in utilising this crop, especially if doubtful of the source of seed supply, as all sorghums hybridise readily. It is realised that many stockowners have fed off Sudan grass at all stages without ill-effects, but it is necessary to point out that fatalities have also been reported as a result of this practice.

Johnson grass (*Sorghum halepense*) is distinctly poisonous, as it contains a greater quantity of HCN than any of the cultivated sorghums. As Johnson grass seed closely resembles that of Sudan grass, buyers of Sudan seed should be particularly careful of the source of supply.

Sugar.

Growing conditions for the young crop were generally unfavourable during the latter half of December. Hot, dry conditions in the far North have seriously checked the cane, and although the absence of heavy rains will effectively check the emergence of beetles, the crop is urgently in need of moisture. Similar conditions obtain in the Mackay area, but the recent beneficial rains in the southern districts have maintained continuous crop growth in those parts, and there is every indication that heavy tonnages will again be recorded in 1935.

The south-eastern and Darling Downs farm and dairying lands are experiencing a bountiful season, prospects for all summer crops being excellent, while dairy production has reached a high level. Owing to this high production dairying is now the most remunerative occupation in many districts in spite of the lower price levels prevailing. At the time of writing the northern farming lands are still urgently in need of rain, so that cane, tobacco, and all seasonal crops are suffering. The central-western pastoral areas are also in the grip of drought and all stock routes are being closed.

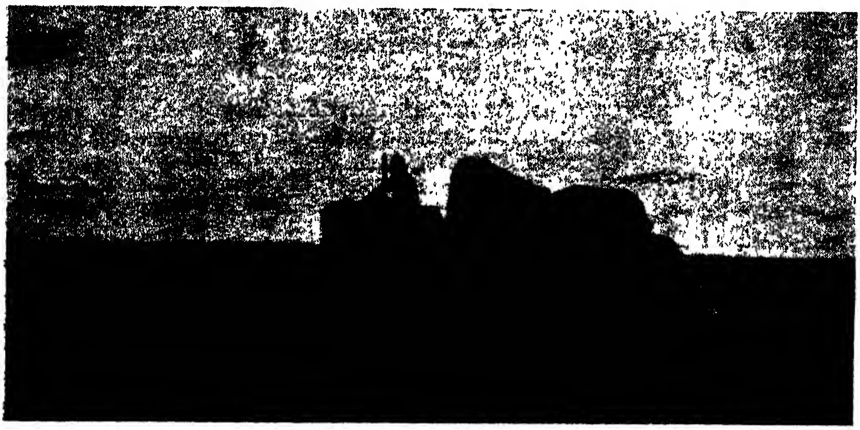


PLATE 87.—AUTO-HEADER COMMENCING A ROUND, ZEISEMER BROS.' FARM, BONGEEN, DARLING DOWNS.

The sugar yield is estimated at 610,000 tons, as compared with 638,000 tons for the 1933 season. In many mill areas, however, large areas of cane were allowed to stand over.

Two of the mills in the Burdekin area are still crushing the 1934 crop, but it is expected that the decline in sugar content of the cane due to further growth will result in an early cessation.

Conditions for the 1935 crop were variable during the past month. In the southern cane areas generally favourable conditions were experienced, and the crop has made very satisfactory progress. There can be little doubt that most mills in these parts will again be faced with excessive cane supplies for the 1935 crushing.

Portions of the Mackay area have been favoured by thunderstorm rains, which have maintained reasonable growth in the crop; but in other parts soaking rains are urgently required to revive the wilting cane.

8

PLATE 88.—AUTO-HEADER AT WORK IN BADLY LODGED CROP, J. FLEGLER'S FARM, EVANSLEA, DARLING DOWNS.

The Burdekin district has experienced hot, dry conditions, and irrigation plants are working at full pressure.

In the far northern areas one of the worst dry spells on record has had a damaging effect on the young cane. The rainless conditions extended through December and the first half of January, but were broken by good rains during the past week. Doubtless the severe growth check will be reflected in the ultimate yields, and it is fairly safe to predict that no mills in those districts will this year produce cane in excess of their peak-year allotments.

Wheat.

Deliveries to the Board are practically finalised, and growers on the extensive plain lands are already working the clock round preparing their land in readiness for the autumn sowing. Heavy rains have held

PLATE 89.—AUTO-HEADER AT WORK, ZEISEMER BROS.' FARM, BONGEEN, DARLING DOWNS.

PLATE 90.—A HARVESTING SCENE ON J. FLEGLER'S FARM, EVANSLEA, DARLING DOWNS.

up the work in many districts, but much of this moisture will be conserved by judicious cultivation. The recent crop, although insufficient for the State's requirements, was of higher quality than in previous years. It is estimated that 1,500,000 bushels will need to be imported, so that Queensland wheat farmers still have some leeway to make up.

Cotton.

The seasonal conditions, while at times tending to make somewhat sappy growth of plant, have been favourable as a whole, for satisfactory development of the cotton crop. In sections of the Upper Burnett excessive rainfall in November promoted such rank growth of grass and weeds, as well as actually washing out the crops, that some abandonment of acreage resulted. Generally speaking, however, the growers have accomplished good control of the weed and grass problem, and the fields are in a satisfactory state of cultivation, although strenuous efforts have been required to bring this about.

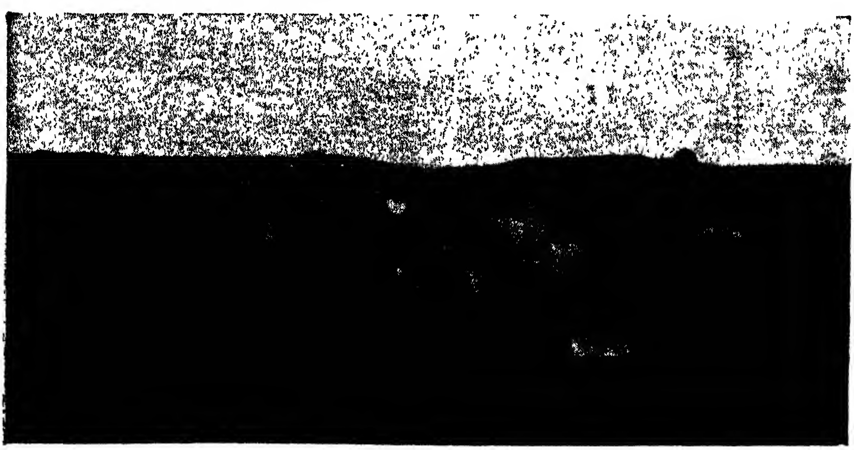


PLATE 91.—A "BATTERY" OF AUTO-HEADERS ADVANCING EN ECHALON ON J. FLEGLER'S FARM, EVANSLEA, DARLING DOWNS.

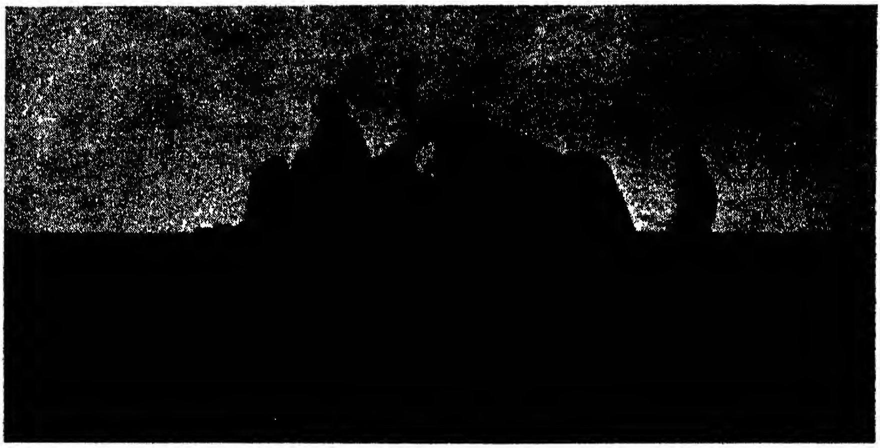


PLATE 92.—AUTO-HEADER DELIVERING THE BAGGED GRAIN ON J. FLEGLER'S FARM, EVANSLEA, DARLING DOWNS.

Although the crop was roughly a fortnight late at the start, the good growing conditions have forced plant growth, and the earlier-sown crops are about of normal development. Flowering is general in all districts, and given a continuance of such favourable conditions, the prospects are bright for very satisfactory yields being obtained generally. Seed sufficient to plant from 60 to 65,000 acres was applied for this season, and it is estimated that around 60,000 acres are now in condition to produce a yield. It appears likely that another record crop may be produced.

PLATE 93.—WHEAT DELIVERY AT THE GRAIN SHED, BONGEEN, DARLING DOWNS.

Peanuts.

The 1933-34 crop was the second largest handled by the Peanut Board. Prospects for the present crop are very encouraging, as 10,500 acres are sown, mainly to the Virginian and Spanish varieties, and sufficient moisture exists to carry the crop through to maturity. However, growers have a big task in cleaning up their areas following on the excessive rains experienced during January.

Tobacco.

Conditions are satisfactory in the Texas and adjoining districts, where the crops are well advanced. Planting out is in full swing in the Central districts, where normal growth and comparative freedom from disease is being experienced. The North is not so fortunate, as planting is largely held up for lack of rain, and those areas already planted are maturing too rapidly for best results.

General.

Maize grain has been in demand for drought relief, which should reduce the carry-over and help to stabilise prices. Heavy main crop sowings have been made under good conditions, with the exception of the Atherton area, where 25,000 acres sown during December urgently require rain.

The early potato crop has been satisfactory both for yield and the prices received. Growers will be interested to know that this Department has made small experimental sowings of Victorian and Tasmanian varieties, some of which have compared favourably with the varieties in general cultivation. However, it must be emphasised that while the trials are in progress no distribution of seed can be attempted.

Those contemplating the use of fertilizer are reminded that the bonus of 15s. per ton has been renewed until 30th June, 1935, the necessary application forms being available at all country post offices.

TO PRESERVE HARNESS.

1. Before oiling harness or other leather, add a little kerosene to the oil. This will prevent rats and other vermin attacking the leather.

2. Get a fresh shin-bone, break it open and extract the marrow. Melt the marrow down and add an equal quantity of castor oil. Rub the mixture warm into the leather, first washing the sweat and grease off with warm water and soft soap. Never use castor oil alone; it will perish any leather.

3. A harness dressing that will prevent rats from chewing the leather can be made by mixing a gallon of castor oil, a pint of salad oil, and ½ lb. beeswax.

4. To revive old, cracked harness, apply a mixture of 2 oz. beeswax, 1 oz. of lamp-black, and a pint of oil. To keep harness in good condition, wash it with potash water and when dry apply harness blacking. To keep leather pliable, rub tallow, lamp-black, or waste oil on.

5. To get a good home-made harness dressing, mix 2 lb. mutton fat with 3 lb. beeswax and heat over a slow fire. Add 4 lb. sugar, 2 lb. lamp-black, 2 lb. soft soap, ½ lb. indigo. For brown harness leave out the lamp-black and the indigo.

The Poultry Industry in Queensland.

By P. RUMBALL, Poultry Expert.

POULTRY-raising is now a very definite and important branch of agriculture. This is due largely, in the first instance, to the labours of the specialist breeder in the production of high-producing strains of birds; secondly, to the modern method of hatching and distribution of chickens; thirdly, to the more efficient method of feeding and general management; and, finally, to co-operative effort on the part of the producer.

Although the specialist poultry breeder has played a most important part in the building up of the organisations that exist, a very large percentage of our eggs are produced upon the general mixed farm, and it is considered by the writer that if further expansion of the poultry industry is to take place, such expansion would be sounder as a definite part of general farming rather than as a specialised calling.

Departmental Activities.

In the building up of the industry, the Government has been an important influence. On the staff of the Agricultural Department there have for many years been attached experts whose duty it has been to advise and instruct beginners in all phases of poultry culture. These officers have pursued an intensive educational campaign and have travelled from one end of Queensland to the other, advising and rendering assistance to all interested in the business.

As well as catering for the producer in this way, the Department for years conducted egg-laying competitions with the object of demonstrating to the breeder the variation in production that may occur among birds of the same breed, and to induce breeders to improve the production of their flocks by selection, and by only breeding from their highest producers.

The interest taken by poultry-raisers in the work has been evinced by poultry clubs and agricultural organisations building their own pens and conducting their own laying contests, and to-day we have no less than eleven egg-laying competitions conducted along the coastal area from Toowoomba to Cairns, clubs having taken up competition work, the Department vacated this field of activity and concentrated upon nutritional and disease research at the Animal Health Station, Yeerongpilly.

Several reports of the results of nutritional investigation conducted at the Station and a report on the results obtained with various methods of treating internal parasites have been published in the "Agricultural Journal." At the present time, further experiments are being conducted with respect to internal parasites, while no less than six experiments of a nutritional nature are under way.

The conducting of experiments, however, is not the only work carried out at the Animal Health Station on behalf of the poultry-raiser. The post-mortem examination of poultry has become in the last few years a very big item. This work, coupled with the correspondence entailed, together with disease investigation, is no small contribution to the welfare of the industry.

Poultry Clubs.

Poultry clubs are functioning in many centres throughout the State. With few exceptions club members meet regularly for the exchange of ideas, and informative addresses are given by the more skilled among its members or by some other person of authority. Many clubs, as previously mentioned, have taken an active part in the conduct of egg-laying competitions. This has brought before poultry-raisers living in close proximity to where these tests are conducted the advantages to be gained by the keeping of well-bred and well-fed birds better than any centrally conducted test could have done, and now it is the exception to the rule to see any but well-bred flocks on our farms.

Poultry clubs are also the means of disseminating the results of Departmental investigations conducted at the Animal Health Station, and from any other authoritative source.

Economic production has received the attention of clubs, the results of one—the National Utility Poultry Breeders' Association—being an outstanding achievement of co-operation.

PLATE 94.—MR. STANLEY LLOYD.
Chairman of Directors, Poultry Farmers' Co-operative Society.

Successful Co-operation.

The Poultry Farmers' Co-operative Society is relatively a young organisation. It was one time known as "Nupba"—a title formed from the initials of the National Utility Poultry Breeders' Association.

Many of the members were not dependent on poultry-raising for a living, but had become associated with poultrymen through a lively interest, as amateurs, in the industry. They were quick to appreciate the difficulties under which poultrymen were struggling, and realising what a valuable place poultry-farming might and should occupy in the State's agricultural operations, conceived the idea of promoting this co-operative organisation to purchase and distribute foodstuffs, these being the most expensive items in the business of poultry-raising. They

recognised that the principles of co-operation would ensure honest trading, pure and high quality goods, and a saving of money by reducing the distributing cost of poultry foods. Further, they ensured that any profits resulting from the undertaking would remain in the industry.

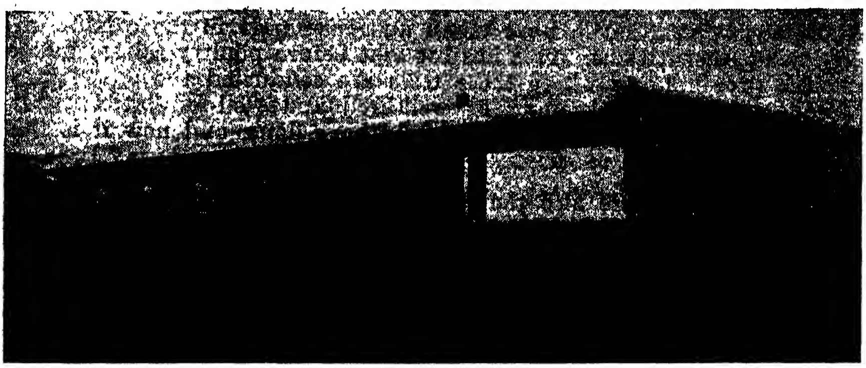


PLATE 95.

Intensive poultry-house at the Animal Health Station, Yeerongpilly. At the right is the feed-room; the brooding-pens are to the left.

Education in Co-operation.

The society is something more than a trading concern. It has an intimate knowledge of the requirements of its customers and, in addition to providing a service in regard to delivery which was previously unknown, it disseminates knowledge on poultry culture and offers free advice on any subject bearing on the industry, both verbally and by means of printed pamphlets. It is difficult to assess the value of the service the society has rendered to the industry, and it has been instrumental in lightening the poultryman's burden considerably by securing reductions in freight charges and improving generally the status of the industry, irrespective of the great saving in prices which has resulted from the combined operations of its members.

Apart from the small annual dividend on the capital invested, the whole of the profits of the society are distributed each year among members as a bonus on purchases, or used in the business for the

PLATE 96.

Intensive poultry-house at the Animal Health Station, Yeerongpilly. At the left are the brooding-pens; at the right is the feed-room. Note the ventilation space at the back.

creation of further benefits. In this way more than £35,000 has been returned to the society's customers during the past ten years.

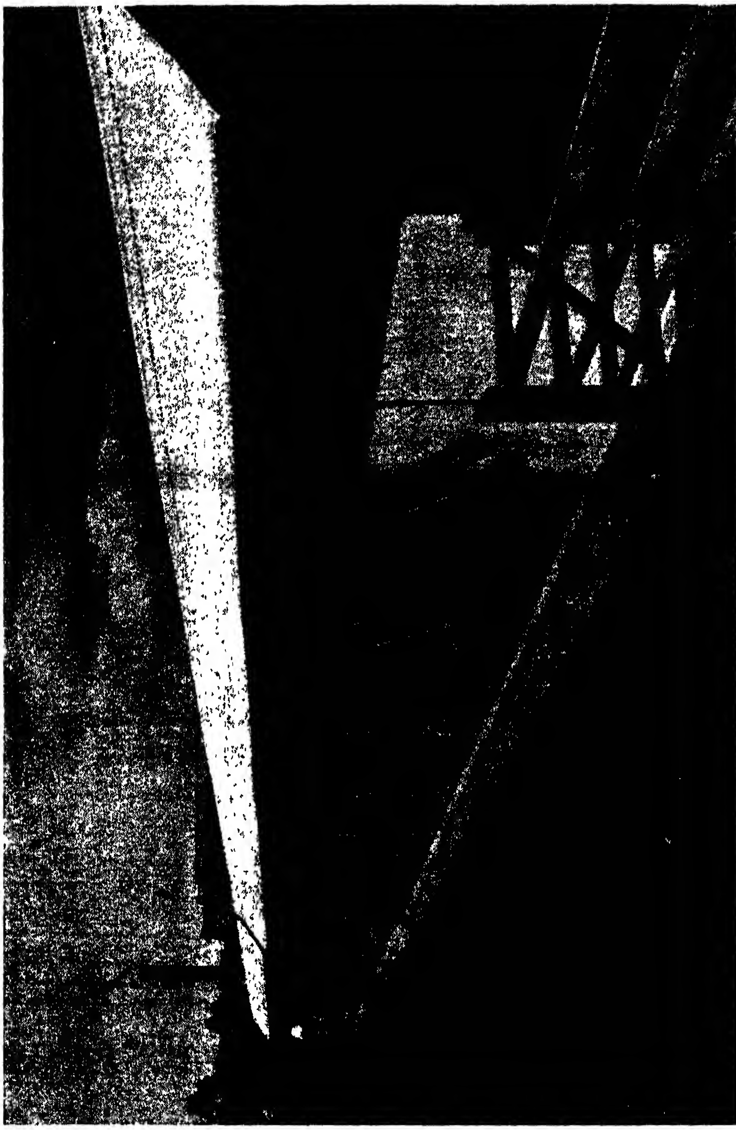


PLATE 97.
Intensive poultry-houses at the Animal Health Station, Yeerongpilly.

The Progress of the Society.

The society has celebrated its thirteenth birthday, having been established in July, 1921, when there were eighty-five members, who contributed a total share capital of £514. The present membership exceeds 1,600, and the share capital exceeds £6,000.

In July, 1921, 8 tons of bran and pollard were purchased by the society's members. The present output is more than 100 times greater, being over 10,000 tons, or over a million bushels annually. In addition,

over 200,000 bushels of wheat are used as grain, besides huge quantities of maize, barley, oats, and other cereals.

The first store secured for the society's business was in the basement of a bulk store in Little Roma street. Mr. Woodcock, the present manager, combined the duties of director, manager, secretary, storeman, and clerk. To-day there are no fewer than fifty-seven persons in regular employment.

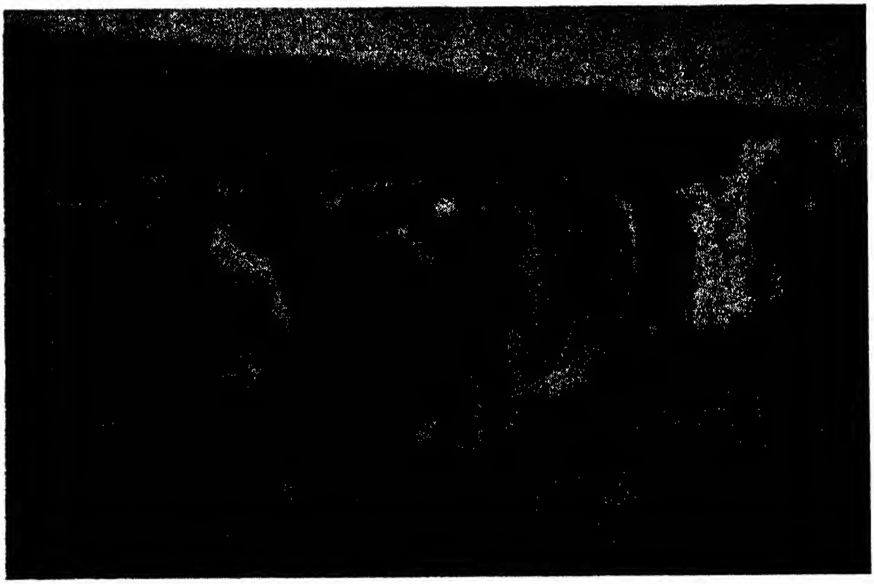


PLATE 98.—INSPECTING THE PENS, POULTRY FIELD DAY, ANIMAL HEALTH STATION.

Trans-Marine Trade.

The society, in 1923, exported 35,000 dozen eggs to England, and in so doing made history, for it was the first occasion on which a co-operative or poultrymen's organisation had shipped Queensland eggs overseas.

The growth of the business is best shown by the following figures:—Turnover for eighteen months ending 31st December, 1922, £20,217; for year 1923, £12,276; 1924, £12,430; 1925, £22,166; 1926, £41,993; 1927, £57,760; 1928, £83,472; 1929, £109,075; 1930, £104,240; 1931, £91,002; 1932, £130,628; 1933, £144,703; and for 1934, approaching £200,000.

The society, in October, 1924, manufactured the first bag of "Red Comb" laying mash, and in so doing launched a new industry for the State. Prior to that date all manufactured balanced poultry foods were imported. This branch of the business has grown rapidly, and new plant is being installed, with a capacity of 1,400 bags daily.

So successful have been the results that the society is now turning out "Red Comb" dairy food, calf food, and pig food, and these give every indication of becoming as popular as the other "Red Comb" products.

Apart from the large sums paid to members as bonus on purchases, the society has saved the industry tens of thousands of pounds in the first cost of the articles sold. It has created a healthy competition to the advantage of its members and the industry generally.

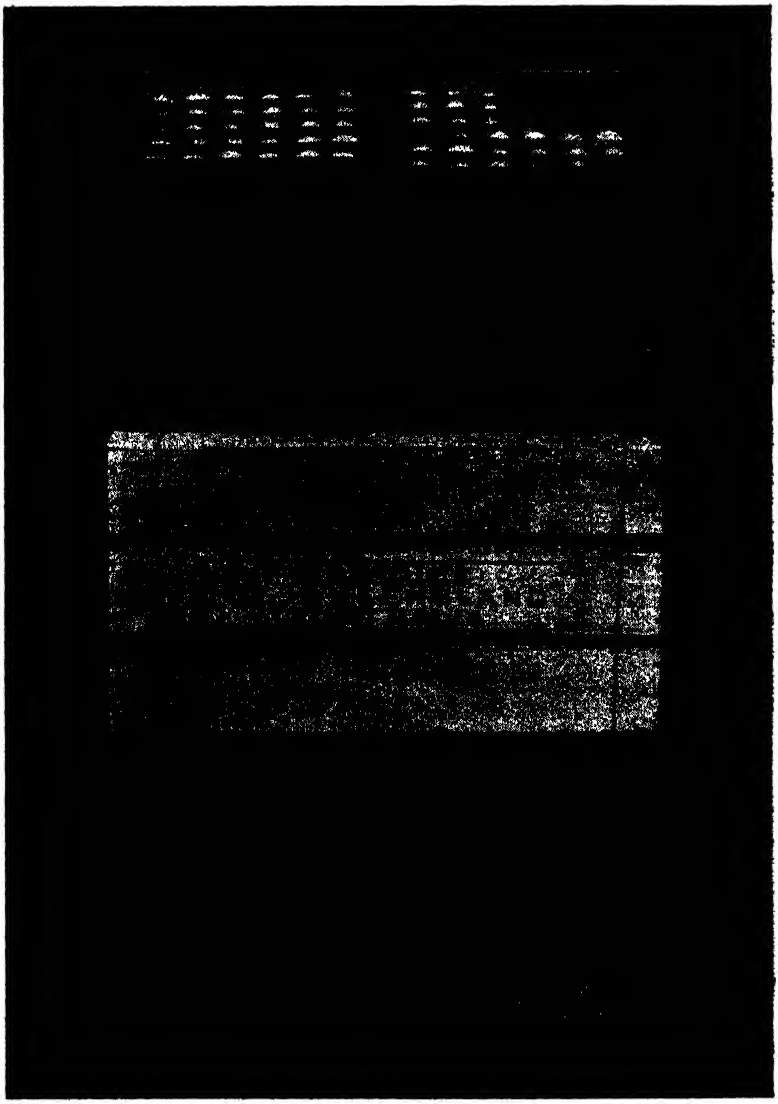


PLATE 99.—QUEENSLAND EGGS PACKED FOR EXPORT.

Huge purchases on a co-operative basis are a benefit to farmers dealing from the society, and low overhead and working expenses have permitted profits to be made, notwithstanding the small margin over cost which the management allows. These profits, instead of being used for private gain, are retained in the industry.

PLATE 100.—TRAIN OF SPECIALLY INSULATED TRUCKS LADEN WITH EGGS FOR OVERSEA SHIPMENT, HAMILTON COLD STORE WHARF, BRISBANE.

PLATE 101.—QUEENSLAND EGGS FOR BRITISH BREAKFASTS.
A Shipside Scene at the Hamilton Cold Store, Brisbane.

Special attention is directed to the Members' Accident Benefit Fund. When a member of the society is permanently disabled or dies as the result of an accident, power has been given to the Board of Directors to grant to the next-of-kin or such person as shall have been previously nominated by the member a sum, not exceeding £250, equal to the member's purchases for the year ending 31st December immediately prior to the accident. This benefit is provided without any premium or additional cost to the member.

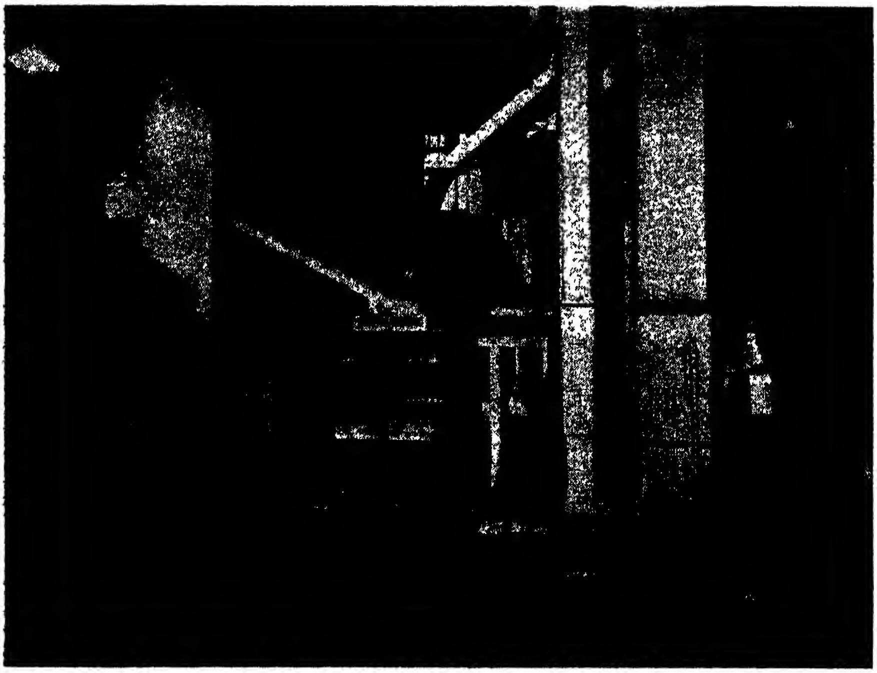


Plate 102.—A Section of the Cleaning and Grading Machinery, Poultry Farmers' Co-operative Society's Mills, Brisbane.

Organised Marketing.

Organised marketing has to the present been confined to the marketing of eggs, but there is every prospect that co-operative effort will be directed, in the near future, to the marketing of live and dressed poultry.

The Queensland Egg Board—a Board that has been functioning for approximately eleven years—controls in the main the marketing of eggs produced in Southern Queensland. On the Atherton Tableland a co-operative society with its headquarters at Tolga is operating on behalf of producers in that area.

That the operations of the Queensland Egg Pool are appreciated by the majority of growers is evidenced by the continuance of the Pool, which has now been submitted to several ballots for its continuance or otherwise. This Pool is controlled by a Board of five elected representatives of the producer, and the Director of Marketing.

Prior to the establishment of the Egg Board, eggs during spring months used to fall in value to a level that left little or nothing over

costs of production. To-day, despite considerable expansion, values during spring months are on a par with those ruling ten years ago. This condition is undoubtedly due to the Board's vigorous policy of exporting the surplus.

It may appear to many that as export has done so much to keep the industry in a reasonably sound condition, the Board had little to do apart from packing for this trade. The Board, which commenced operating during 1924, had met and surmounted many difficulties. The first was financial. The Government, however, helped it out in the early days by guaranteeing its bank overdraft to the extent of £10,000. The Board now is in the happy position of having a general reserve fund to the extent of £20,000, and are therefore more or less free from financial worry.

PLATE 103.—HIS EXCELLENCY THE GOVERNOR, SIR LESLIE ORME WILSON, INSPECTING THE MACHINERY AT "RED COMB" HOUSE, BRISBANE.

Included in the group are Messrs. Stanley Lloyd (Chairman of Directors), R. Woodcock (Manager), and C. Kidd (Secretary).

Although spring prices have been maintained by the Board that compare favourably with those ruling prior to the establishment of a Pool, the general average price paid to the grower during the year has fallen. This fall in values is due to the ever-increasing supplies received by the Board, with the result that for the greater part of the year more eggs are being received than the local market can absorb.

It may appear to some a simple matter for the Board to export the surplus production. This, however, is not the case. A considerable proportion of the eggs forwarded to the Board in the early days of the Pool were rendered unfit for export on account of the uncleanliness

of shell. To correct this was the Board's first problem. Many producers who had been supplying the local market for years when cleanliness of shell was not of such importance, and also many beginners in the business, were difficult to convince that something more in the way of cleanliness of shell was wanted for export than had been the case in past years. Again, large numbers of eggs came from relatively small flocks from mixed farms. With this class of producer the usual practice was to sell to the local storekeeper or wait until a sufficient quantity of eggs were on hand to justify consigning to market. The constant

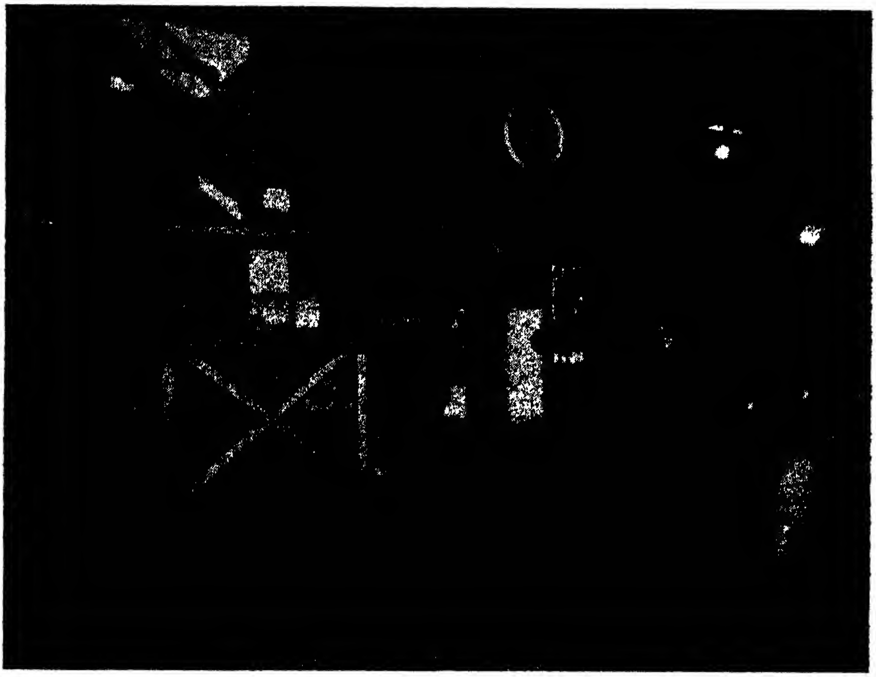


PLATE 104.—POULTRY MEAL MIXING PLANT AND DISINTEGRATOR.

effort on the part of the Board has fortunately convinced poultry-raisers as a whole that cleanliness of shell is essential, and the action taken by the Board in encouraging the formation of egg circles and the appointment of forwarding agents ensures a considerable proportion of our production reaching the Brisbane market of export quality. The writer is pleased to be able to inform poultry-raisers that a prominent inspector of exports, while on a recent visit to Brisbane, stated that for cleanliness and quality the eggs received by the Board from farmers were second to none in the Commonwealth. Although a statement of this nature has been made, there are still some producers forwarding eggs to Brisbane to whose produce it would not apply.

Export Packs.

Various styles of packing have been tried from time to time, with the result that we have a standard of pack which is unequalled on the English market, and, what is more, the costs of packing are considerably less than for what was considered in the early days of the Pool the

most attractive and economic pack. The reduction in costs is in no small part due to the foresight and business acumen of those controlling the Pool.

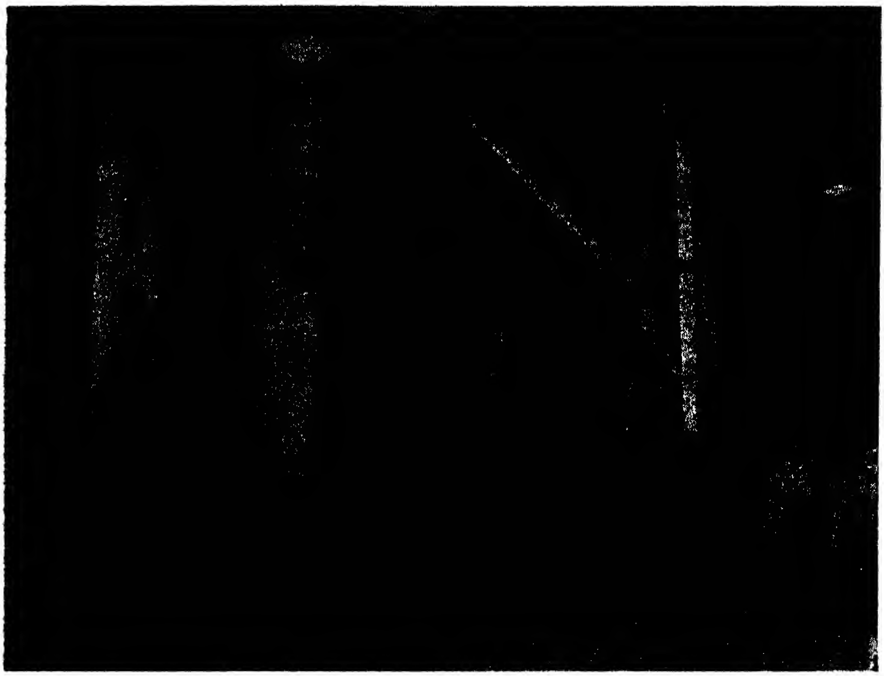


PLATE 105.—GRAIN MIXING PLANT.

Throughout the year, as well as during the export season, every egg received by the Board or its agents is candled and carefully graded as to quality and size. This action has been found essential in order to assure the sale of nothing but eggs true to label. That this practice is bearing fruit by way of increasing consumption is borne out by the statistics that accompany this article having reference to the Board's activities.

QUEENSLAND EGG BOARD STATISTICS.

Year.	Receivals.	Exported Overseas.	Total Sales, Export, Interstate, Pulp.	Local Sales.
	Dozens.	Dozens.	Dozens.	Dozens.
1924	1,445,000	Nil	234,555	1,210,445
1925	1,665,000	12,000	167,795	1,497,205
1926	2,777,000	189,000	436,975	2,340,025
1927	3,040,000	236,400	685,950	2,354,050
1928	3,967,000	823,860	1,580,018	2,386,982
1929	4,563,000	919,410	2,233,587	2,329,413
1930	3,935,000	831,150	1,934,361	2,000,639
1931	3,293,000	768,360	1,301,692	1,991,308
1932	3,728,000	1,301,430	1,667,109	2,060,891
1933	3,985,000	1,458,480	1,815,289	2,169,711

Plate 106.—Roma Street Premises of the Poultry Farmers' Co-operative Society.

Apart from the marketing of eggs, the Board has interested itself in many matters of importance to the poultry industry. It has taken an active part in the formation and work of the Egg Producers' Council, an organisation comprised of representatives of the principal egg-exporting organisations of the various States. It has played no small part in the preparation of egg grades governing eggs exported, and has interested itself in such matters as nutritional-feeding experiments, rail freights and their relation to both eggs and poultry fodder, and at all times has taken every possible action to further and protect the interests of poultry-raisers.

IMPORTATION OF SAANEN GOATS.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) announced recently that he had been in touch with the Queensland Government offices in London regarding the cost of securing Saanen goats from Switzerland. Details had now come to hand and these indicate that first-class male Saanen goats, about 1 year old, can be purchased in Switzerland for from £5 to £6, and first-class female goats, two to three years old, from £3 12s. to £5 each. The cost of bringing the goats from Switzerland to Brisbane is, of course, considerable, and it has been calculated that approximately the cost of conveying the six animals from Switzerland to Brisbane would be somewhat as follows:—

	£	s.	d.
Freight, Basel to Hamburg, or	4	15	0
Freight, Basel to Antwerp	4	16	0
Harbour dues	1	0	0
Freight, Hamburg or Antwerp to Brisbane £14 14s. each	88	4	0
Exchange	1	1	0
Extras in Switzerland	1	10	0
Care of animals, £2 2s. each	12	12	0
London Quarantine expenses	15	5	0
Colmslie Quarantine expenses	19	13	6
Cartage	1	0	0
	£145	0	6

The above works out at about £24 3s. 5d. per animal, and with the initial cost it can be taken that the cost of landing the goats in Brisbane would range from £28 to £30 each. It would probably be preferable to ship the goats from Switzerland, via France, to London, where they could undergo a preliminary quarantine under the direction of the English Department of Agriculture and Fisheries. They could then be shipped direct from England to Australia.

Agricultural conditions of Switzerland being those of small peasantry, the breeding and keeping of goats is, therefore, very important. Swiss goats are rated highly for their great yield of milk and for their fertility, and the flesh of the young wethers is highly esteemed in that country.

The Saanen goat is widely distributed over the western part of Switzerland and is the most common dairy goat of the country. It was first developed in the Saanental and Simmental of the canton of Berne, these valleys still being the centre of the breed.

As Saanen goats are rather adaptable and thrive under a wide range of conditions, exports have been made to nearly all parts of the world, and they are now distributed in Germany, Austria, Servia, Russia, France, and on the American Continent. On an average the Saanen is of somewhat more than medium size. It is pure white in colour, hornless, and of rather slender build. In Switzerland good class does are stated to average about two quarts of milk per day.

Notes on Fruit Marketing.

JAS. GREGORY, Instructor in Fruit Packing.

Apples.

EARLY eating apples are now being marketed. Standard packing using sulphite wraps is the most desirable method of packing. Growers are recommended to line the cases with corrugated cardboards, which give great protection to the fruit. Fruit packed in this way is sought eagerly by country order buyers, in preference to unprotected lines. It must always be remembered that the country order buyer is usually willing to pay top market price if the fruit is satisfactory.

With the export season at hand, growers should give full consideration to the actual state of their crop. Many orchards have a high percentage of fruit damaged with hail. To remove the fruit fit for export from lines of this description would entail a lot of trouble, possibly only 30 or 40 per cent. being fit to export. The remainder of the crop would not be fit to market anywhere. By mixing the hail-marked fruit with the good it would be possible to get quite a satisfactory line for local marketing. This is always a problem to face in a state of affairs of this description. Growers wrapping fruit should be certain that no fly is allowed to be included. Buyers prefer wrapped lines, but for quite a number of seasons they expressed the opinion that growers only wrapped to enable them to include fly-stung fruit. It would be a pity to spoil the goodwill created during the last few seasons.

Stone Fruits.

Apricots and cherries are now finished. Peaches and plums are now obtainable in lines of good quality. Careful attention to packing is necessary to eliminate as far as possible the chances of Brown Rot infection. Brown Rot it particularly prevalent this season. Fruit skins damaged even minutely will become infected much sooner than sound fruit, so growers will realise that the utmost care must be taken during harvesting and packing operations to avoid skin damage. Sizing and packing are necessary when marketing.

Citrus.

The season is now finished. Measures should be taken to see that all sheds, implements, cases, and other utensils are cleaned up in readiness for next season. This should be done to help eliminate chances of Blue Mould being carried over to next season. A 5 per cent. solution of formalin is a good spray to use, 1 part of formalin to 20 parts of water finely sprayed, or used as a dip for boxes, &c.

Tomatoes.

The writer of these notes was recently in Melbourne, and had the pleasure of inspecting some really first-rate lines of Queensland tomatoes from the Redland Bay district. This was in late December during quite a warm spell of weather, and amply proves what has always been contended, that Queensland tomatoes can be exported to Melbourne and Sydney provided care is taken in picking to maturity and packing. The

same state of affairs does not exist with fruit exposed for sale in Stanthorpe shops, it being hard at the time of writing—early January—to obtain really good ripe lines of fruit, most of the fruit giving the impression of being picked while immature. This fruit is being obtained mainly from metropolitan districts.

Papaws.

Inspections on the Melbourne market showed several unsatisfactory lines of fruit on the market. Growers must pack papaws with care, carefully wrapping each fruit in paper and "nesting" them in woodwool, placing a substantial layer of woodwool on the top and bottom of the case. I would recommend the placing of corrugated cardboard at the sides of the box in addition to the woodwool on the tops and bottoms. One line of fruit that I inspected, on repacking, showed approximately 60 per cent. waste, all of which could have been avoided with a little more care. It was a pleasure to see the famous Sunnybank brand of "Melloripe' papaws open up, the packing being all that could be desired.

Mangoes.

Bowen mangoes arrived in varying condition. Fruit wrapped and layer packed with woodwool always opened up in good order. One or two lines of fruit I examined, packed unwrapped and without the padding, showed a high percentage of waste. Half-bushel cases appear to be the best type of case in which to send this fruit to Melbourne. I would suggest that it would be even better to send mangoes in trays, such as are used by the pear exporters. The trays are put up in bundles of threes, the complete package looking like a dump case. Each tray measures 18 inches by 14½ inches by 3 inches, or sometimes as a variation to suit the size of the fruit, 4 inches deep. I think a package of this description would suit the trade better, as mangoes at present are not a well-known fruit in Melbourne. Retailers wishing to introduce this fruit to customers can only afford to buy small containers, in most cases even a half-bushel case being too large a quantity. The trays would also have an excellent display value.

Pineapples.

Blady grass is still used by many growers. It is not a popular packing with retailers, the fruit as a rule opening in a damp musty condition. Woodwool is to be preferred in all respects, looking better and opening up in a sweeter condition. It was noticed that some growers still persist in pulling the fruit instead of cutting it. One or two lines of Bowen pines were harvested too green, and in consequence were hard to sell. By the time these pines colour sufficiently to sell, the fruit has developed a shrivelled, wilted appearance, which makes it unpopular with the public.

TO MEASURE LENGTH.

To measure the length of, say, a drain, tie a piece of white rag round a spoke of the wheel of a buggy, the vehicle being then advanced until the wheel has made a complete revolution. A mark having been made on the ground before starting, the circumference of the wheel is easily measured. Then by driving along the proposed route of the drain and counting the number of revolutions of the wheel the total distance is readily arrived at.

Tobacco Fertilizer Trials.

Subjoined is a report on tobacco fertilizer trials conducted in the Mareeba and Dimbulah districts during the 1933-34 season by Mr. W. J. Cartmill, B.Sc., Analyst, Department of Agriculture and Stock.

DURING the 1933-34 season, an effort was made to establish fertilizer trials on each of the major soil types of the tobacco areas of the Cairns hinterland. The aim was to establish about a dozen trials, distributed over the fairly diverse soil types of this wide area. However, owing to extremely adverse seasonal conditions, it was not possible to accomplish this aim. The ravages of blue mould and other fungus diseases were so severe that seedlings could not be obtained for some of the trials. Repeated efforts to establish others were rendered unavailing by the destruction of the young plants by torrential rain and by disease attacks. Eventually four trials were established satisfactorily, and the results of these are set out herein.

The trials were uniform in type and treatment, the object being to find out the effects of the three principal plant foods on the growth and quality of the plants and the extent to which these effects are governed by the various soil types. The blocks were each one-half acre in area, divided into twenty-five small plots by a 5 x 5 Latin square system of replication. The treatments used were as follows:—N P K, N P, N K, P K, and C where—

$$N = \left\{ \begin{array}{l} \text{160 lb. dried blood per acre (20 lb. N)} \\ \text{130 lb. nitrate of soda per acre (20 lb. N)} \end{array} \right\} = \text{40 lb. N}$$

$P = 500$ lb. superphosphate per acre $= 100$ lb. P_2O_5.

$K = 105$ lb. sulphate of potash per acre $= 50$ lb. K_2O.

$C =$ no fertilizer.

On one trial a treatment of N_APK was used (Boundy Bros.) where—

$N = 200$ lb. per acre of sulphate of ammonia.

$A =$ 40 lb. nitrogen.

P and K are as previous.

These quantities of plant food were considered to be liberal for the requirements of the crop. The fertilizer mixtures used in the tests were prepared a few days prior to their applications in the field. The quantity for each plot was weighed and that for each row was measured so as to ensure a uniform application. The land was slightly ridged and the fertilizer distributed by hand in a broad strip along the middle of the ridges. The fertilizer was then covered by and mixed with the soil by further ridging and the land thus prepared for transplanting. The one departure from this procedure was in the case of J. Scott's trial at Koah. Here the grower transplanted the seedlings to the block prior to the application of the fertilizer, as he considered they were in imminent danger of destruction by mould while in the beds. The fertilizer was applied and hoed in a few days after transplanting.

The usual cultural practices as are ordinarily adopted by the grower were used during the growth of the crop.

The weather conditions at the commencement of the trials were abnormal. The rainfall was excessive and the temperatures generally were rather low. Later, normal conditions prevailed.

There was a difference in growth on the various plots according to the fertilizer treatment, which was particularly pronounced during the early stages. It was difficult to obtain a good stand of plants on plots without either phosphorus or nitrogen in the fertilizer treatment and on the plots without fertilizers. In the first place the plants would not strike readily, and then made such very slow growth after striking that many of them were destroyed early by insect pests and diseases, and so many replants were necessary.

Plants in the P K plots usually made no pronounced growth for several weeks after planting; the leaves manifested a pale yellowish-green colour, generally were small in size and stiff; the plants themselves were spindly. When about two months old the plants made fair development, and eventually grew to a fair size with leaves showing a yellowness when compared with other plots. The leaf from these plots cured brightest, but the yields generally were low.

Plants in the N K plots made very poor growth for a considerable time after striking. At this stage they were dark-green in colour and had a squat rosette formation, and remained without making any appreciable growth for several weeks. Insect pests, such as leaf miner and stem borer, played havoc with these plants, also bringing about an uneven stand of plants under these treatments. The plants eventually made fair growth, but were always late in maturing and could not be cured a bright colour.

Plants on the N P plots grew well and seemed in no way to be affected in growth by the absence of potash from the mixture. Their growth up to maturity was as good as those on the complete mixture (N P K) plots. However, as the plants reached maturity they manifested to a marked degree the symptoms of potash deficiency. The leaves became very curled and puckered, but otherwise were not much blemished. The leaf usually straightened out during the curing and cured satisfactorily. However, the quality of the cured leaf was not good. It was usually of poor texture and without any elasticity.

The plants on the N P K plots were apparently normal. Owing to their having been grown fairly late in the season the quality of the leaf was not of a high grade, the colour being about equally bright mahogany and mahogany.

Plants on the plots without fertilizer were slow in making growth at the start, but later made fair development excepting on the virgin grey sandy soil, where the growth was poor. Apart from their backwardness the plants showed no outstanding peculiarity.

None of the leaf was much blemished by spotting, so that comparisons in this respect between the plots could not be made with any assurance of a distinction. If anything, the N K plots had least spot and the N P most.

Numerous practical difficulties were experienced in the working of the trials, but a number of these can be attributed to the adverse seasonal conditions and the lateness in starting the trials, and which probably would be avoided in a season of more favourable conditions and with an early start. As previously stated, the scarcity of seedlings, especially of healthy seedlings, precluded the establishment of more trials. It is reasonable to expect that this trouble would not be of such consequence if an effort is made to establish the trials early in the season. One trouble, however, will probably always be experienced—that is, that some of the farmers concerned herewith, show a reluctance to plant out the plots until they are satisfied of obtaining sufficient seedlings for their own intended acreage for the season, or even until they have planted up same. The seedlings put into the plots in these circumstances are often the poorest of the bed and are difficult to establish. This trouble would of course be mitigated by a favourable season. Some neglect is shown with regard to cultural attentions to the plots, especially when the total acreage planted is beyond the farmer's management. In such instances the plots suffer most. During the past season most of the work was done by the Departmental officers; it took up a large proportion of their time and interfered with their professional duties. The work in connection with these trials is much enlarged by the lack of communication throughout the area. At planting and harvesting time, especially at the latter, frequent visits had to be made to the plots to find out on what day the farmer expected to be carrying out these particular operations, for usually such cannot be foretold beyond a day or two. This required much travelling about.

The harvesting and stringing operations were usually done by the Departmental officers, and as the leaf from the various plots had to be labelled and kept apart, the work involved was large. The number of harvests from each trial varied from six to ten.

The question of growing the same variety of tobacco on all the trials is worth considering. During the past season the varieties differed according to what was grown by the various farmers concerned. It is doubtful whether the practice of growing different varieties on different plots would in any way effect the conclusions arrived at, but, nevertheless, it is thought that uniformity in this respect would be desirable if it could be attained. This would require that the seedlings for all the plots be grown in a common bed or that the farmers be distributed with seed of the chosen variety and requested to set aside a seed-bed for the plot. However, against this arrangement must be set the possibility of losing the seedlings on account of disease and being left with none to draw on, so the question arises as to whether it would not be preferable to take advantage of the first crop of seedlings that happens to be available, irrespective of the variety, provided, of course, that the one variety is used in any one particular trial.

Reviewing the results, they show in general that in all cases the greatest response is given to phosphoric acid, but that it differs in degree according to the soil type. The greatest effect is noticed on the lighter and more porous soils, where there is little or no growth when phosphoric acid is not supplied in the fertilizer mixture. On heavier soils the response is not so marked.

There is also a good response to nitrogen, most marked in the porous sandy soils and less so in virgin and the heavier types. There is no

significant difference in yield and no apparent difference in quality shown between the treatments of sulphate of ammonia and nitrate of soda—blood. However, as the quality of either was not of a high grade owing to the crop having been grown late in the season, the comparison in this respect cannot be regarded as reliable.

The effect of potash is more marked on quality than on yield. In only one instance did potash give a significant increase in yield; but an absence of potash was noticed in all cases to affect the quality of the cured leaf adversely. In some soils it may be found that excessive supplies of potash decreases the yield. This matter needs further investigation.

TOBACCO EXPERIMENTAL PLOTS.

STIRRUP BROS., MAREEBA.

Variety.—Cash.

Planted.—Early in February.

Harvested.—June-July.

Growth.—It was difficult to strike plants on the N K and P K plots and on the plots with no fertilizer. However, they all subsequently made fairly good growth. Though there was a difference in growth and in appearance of the plants under the different treatments during the early stages, there was not much during the later stages.

Soil.—Red sandy.

Subsoil.—Red sandy (sl. clayey).

YIELDS :—lb. per acre of cured leaf.

NP 332	C 185	NK 463	NPK 644	PK 616
NPK 478	NK 332	C 457	PK 538	NP 588
PK 288	NPK 519	NP 782	NK 641	C 575
NK 225	NP 400	PK 541	C 560	NPK 669
C 275	PK 510	NPK 819	NP 625	NK 525

ANALYSIS OF VARIANCE.

Due to	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ loge (Mean Square).
Rows	4	49,220·2	12,305·1	..
Columns	4	383,328·6	95,832·2	..
Treatments	4	149,001·0	37,250·3	1·8089
Errors	12	59,440·3	4,953·4	·8000
Total	24	640,990·1	..	..

$$\text{Standard error (5 plots)} = \sqrt{4{,}953{\cdot}4 \times 5}$$
$$= 157{\cdot}3$$
$$= 6{\cdot}2\%$$

SUMMARY OF YIELDS.

	NPK	NP	PK	NK	C
Yield (cured leaf), lb. per acre	625·8	545·4	498·6	437·2	410·4
Cured leaf, percentage mean yield	124·3	108·3	99·0	86·8	81·5

Discussion.

Significant response to phosphoric acid and nitrogen. No significant response to potash.

J. SCOTT, KOAH.

Planted.—Second week in March. Fertilizer applied a few days after planting and hoed in.

Harvested.—End of June. Plants uprooted and green weight taken.

Growth.—N K plots and plots with no fertilizer made practically no growth; P K plots moderate growth; N P and N P K plots good growth. The leaf on this block was blemished by mould spots to such an extent that the owner considered it would not repay harvesting the small quantity of leaf, as he had no more tobacco under cultivation. Consequently the plants were uprooted and the green weight taken.

Soil.—Light-grey sandy.

Subsoil.—Light-yellow sandy.

J. SCOTT, KOAH

YIELDS :—(Green leaf, lb. per $\frac{1}{50}$ acre plot).

NP 83	C 10	NK 11	NPK 94	PK 51
NPK 76	NK 14	C 17	PK 55	NP 66
PK 64	NPK 85	NP 125	NK 16	C 16
NK 9	NP 91	PK 77	C 14	NPK 81
C 8	PK 58	NPK 88	NP 73	NK 6

ANALYSIS OF VARIANCE.

Due to	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ loge (Mean Square).
Rows	4	821·0	205·26	..
Columns	4	1,080·6	270·16	..
Treatments	4	28,043·4	7,010·86	3·2764
Errors	12	929·1	77·42	1·0233
Total	24	30,874·1	..	..

Standard error (5 plots) $= \sqrt{77 \cdot 42 \times 5}$.
$= 19 \cdot 7$
$= 7 \cdot 7\%$

SUMMARY OF YIELDS.

—	NPK	NP	PK	NK	C
Yield (green leaf), lb. per 1/50 acre	84·8	87·6	61·0	11·2	13·0
Green leaf, percentage mean yield	164·7	170·1	118·4	21·7	25·2

Discussion.

The increase due to phosphoric acid is very significant. Nitrogen has caused a significant increase, but potash has made no significant difference. This is a virgin soil, apparently very deficient in phosphoric acid.

BOUNDY BROTHERS, DIMBULAH.

Variety.—Cash.

Planted.—Second week in February.

Harvested.—June-July.

Growth.—Plants on N K plots were difficult to strike and made poorest growth during early stages. They were of a deep-green colour and assumed a squat-rosette form. P K plots were also very slow in early stages. Yellowish-green in colour, spindly in shapes with frenching of the leaves apparent.

N P K and N P plants made good growth of healthy appearance up to maturity, when leaves of plants on N P plots became curled and puckered. On N_A P K plots the plants made good growth. The colour of the leaves in the early stages of growth was a light-green, quite marked in comparison with N P K plants. Later (when six or seven weeks old) the plants quickly became of a deep-green colour. This in turn lightened off as the plants neared maturity. There was no marked difference in any respect between the cured leaf from the N P K and N_A P K plots. The plants in this trial were attacked by the stem borer during their early growth, and most of them were cut back to rid them of this pest. This operation did not apparently affect their subsequent growth.

Soil.—Light-pink gravelly sand.

Subsoil.—Light, red, sandy.

YIELDS:—Cured leaf, lb. per acre.

NP 450	N_APK 907	NK 41	NPK 778	PK 238
NPK 603	NK 275	N_APK 540	PK 316	NP 441
PK 207	NPK 738	NP 653	NK 250	N_APK 719
NK 132	NP 666	PK 253	N_APK 785	NPK 722
N_APK 500	PK 250	NPK 450	NP 478	NK 244

ANALYSIS OF VARIANCE.

Due to	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ loge (Mean Square).
Rows	4	61,131·76	15,282·94	..
Columns	4	136,034·96	34,008·74	..
Treatments	4	1,074,237·36	268,559·34	2·7966
Errors	12	85,546·08	7,128·84	·9821
Total	24	1,356,950·16	..	..

Standard error (5 plots) $=\sqrt{7128 \cdot 84 \times 5}$.
$=189$
$=8 \cdot 1\%$

SUMMARY OF YIELDS.

	N_APK	NPK	NP	PK	NK
Yield (cured leaf), lb. per acre	690·2	658·2	537·6	252·8	188·4
Cured leaf, percentage mean yield	148·3	141·4	115·5	54·3	40·5

Discussion.

There has been a very significant response to both phosphoric acid and nitrogen. There has also been a significant response to potash. The difference between the sulphate of ammonia and the nitrate of soda-blood treatments is insignificant.

SHAW AND O'BRIEN, DIMBULAH.

Variety.—Hickory Pryor.

Planted.—Second week in February.

Harvested.—June and July.

Growth.—Poor growth on the N K and P K plots and on plots with no fertilizer during the early stages. Subsequently, all plots made fairly good growth. The fertility of the soil in this case seems to be above the average, which is probably the effect of residual fertilizer from previous applications.

Soil.—Pink, sandy.

Subsoil.—Reddish, sandy.

SHAW AND O'BRIEN, DIMBULAH.

YIELDS :—Cured leaf, lb. per acre.

NP 760	C 685	NK 640	NPK 665	PK 595
NPK 785	NK 715	C 700	PK 690	NP 795
PK 605	NPK 810	NP 805	NK 615	C 470
NK 545	NP 870	PK 625	C 535	NPK 695
C 630	PK 705	NPK 740	NP 725	NK 580

ANALYSIS OF VARIANCE.

Dueto	Degrees of Freedom.	Sum of Squares.	Mean Square.	½ loge (Mean Square).
Rows	4	22,106	5,526·5	..
Columns	4	53,006	13,251·5	..
Treatments	4	132,966	33,241·5	1·7518
Errors	12	17,188	1,432·3	·1794
Total	24	225,266	..	..

Standard error (5 plots) $= \sqrt{1{,}432{\cdot}33 \times 5}$
$= 84{\cdot}6$
$= 2{\cdot}5\%$

SUMMARY OF YIELDS.

—	NPK	NP	PK	NK	C
Yield (cured leaf), lb. per acre	739	791	644	619	604
Cured leaf, percentage mean yield	108·8	116·4	94·8	91·1	88·9

Discussion.

Significant response to phosphoric acid and nitrogen. The decreased yield due to potash is barely significant.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advance Register of the Herd book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, The Guernsey Cattle Society, and The Ayrshire Cattle Society, production charts for which were complied for the month of December, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Elsie of Blacklands (365 days)	H. D. Giles, Biggenden	13,567·9	620·581	Jean's Monarch of Blacklands
Lorna 5th of Arley	E. W. Lawley, Maleny	9,184·15	388·12	Cinderella's Recruit of Greyleigh
Glenroy Lilly	W. F. Kajewski, Glencoe	8,560·37	379·032	Brilliant 2nd of Oakvale
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Springleigh Primrose 2nd (365 days)	Moller Brothers, Boonah	12,307·7	488·916	Red Knight of the Cedars
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Meadowvale Iris 5th	W. F. Kajewski, Glencoe	8,507·	361·602	Youll Do of Meadowvale
Westbrook Lark 5th	W. F. Kajewski, Glencoe	7,263·67	291·359	Sheik of Upton
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Glenroy Ruby	W. F. Kajewski, Glencoe	7,644·98	316·902	Empress Kitchener of Burradale
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Glenroy Emerald (365 days)	W. F. Kajewski, Glencoe	11,439·26	438·688	Glenroy Kitchener
Trevlac Rosette	W. J. Freeman, Rosewood	6,507·5	296·329	Butter Boy of Rhodes View

JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Wandegong Dorothy	G. D. Lindenmayer, Binjour	9,312 5	338·662	Emperor of Spurfield
Meadowvale Favourite 19th	W. F. Kajewski, Glencoe	8,087·29	331·488	Youll Do of Meadowvale
Rhodesview Nancy 9th	W. Gierke & Sons, Helidon	6,739·22	298·842	Blackland's Prospector
Cedargrove Champion 6th (265 days)	W. J. Freeman, Rosewood	7,170·	296·825	Duke of Cedar Grove
Euroa Rexona	H. T. Lindenmayer, Mundubbera	8,084·	283,305	Swagman of Clonagan
JERSEY.				
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Billabong Daisy (365 days)	J. Mollenhauer, Moffatdale	10,432·1	543·2	Premier of Calton
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Hampstead Sapphire	Cecil Roberts, Harristown	5,916·59	326·214	Kelvinside Favourite's Raleigh
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Bellgarth Girlie	A. R. Slaughter, Clifton	5,906·85	333·56	Bellefaire Blonde's Noble Masterpiece
Lyndhurst Mary	J. B. Keys, Gowrie Little Plains	5,689·41	305·871	Lyndhurst Glider
GUERNSEY.				
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Linwood Sunbeam	A. S. Cooke, Maleny	6,557·25	335·951	Moongi Bright Boy
AYRSHIRE.				
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Fairview Myola Juliette	R. M. Anderson, Southbrook	5,843·8	268·382	Longland's Bonnie Willie 2nd

Land for Grazing Homestead Selection

BLADENSBURG RESUMPTION.

WINTON DISTRICT.

40,430 acres .. .. Sheep land.

Portion 2, parish of Williams, situated on Williams and Meteor Creeks, about 32 miles south-west of Winton, will be opened for Grazing Homestead Selection at the Land Office, Winton, on Tuesday, 26th March, 1934.

Term of lease, 28 years; rent, 1¼d. per acre for first 7 years. Provisional valuation of improvements, £2,150. The improvements consist of fencing, a hut, sub-artesian bores, and equipment.

Part of the area is rough, but the greater part consists of open downs grassed with Flinders, Mitchell, button, blue, and other grasses.

The area is sufficiently watered, and is suitable for woolgrowing, fattening, and breeding.

Stocking conditions will apply.

Free lithographs and full particulars obtainable from the Land Agent, Winton, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence Bureaux, Sydney and Melbourne.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Answers to Correspondents.

BOTANY.

Selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Russell River Grass.

C.P. (Gympie)—

Paspalum paniculatum, Russell River Grass, a very common grass in North Queensland. It was much boomed as a fodder some years ago under the name of *Paspalum galmarra*, but has since gone out of favour. Like some other grasses, however, such as Molasses Grass, stock seem to take to it readily when other feed is not available. In North Queensland, where the grass is very common, especially on parts of the Atherton Tableland, horses are said to be remarkably fond of the seed heads, and when feeding on them have a very sleek appearance with glossy coats.

The Bottle Tree.

A.H.B. (Brisbane)—

The common Bottle Tree of the Burnett district is *Sterculia rupestris*. The genus is a fairly large one and contains some well-known Australian trees. Two other species of Sterculia are known as Bottle Trees in Queensland; one, which grows in the scrubs in the coastal belt, is known as the Scrub Bottle Tree; the other, with a large lobed leaf and common in parts of Central Queensland, on the coast and on some of the islands of the Whitsunday Group, is known as the Broad-leaved Bottle Tree. Neither of these produces anything like so shapely a "bottle" stem as the one from the Burnett and parts of the northern Darling Downs.

The nearest ally of the Bottle Trees is the Currajong. The seeds of the Currajong have been used as a substitute for coffee, though when roasted and ground they have far more the flavour of cocoa. This is not surprising as botanically our Bottle Trees and Currajongs are very closely related to the Cocoa Tree which produces the cocoa of commerce. Possibly Bottle Tree seeds could be used in the same way as those of the Currajong, although we have not heard of their being so employed anywhere in the country where we have been.

The Bottle Tree referred to possesses what is known to botanists as dimorphic foliage, that is, the leaves are of two distinct types, those on the young trees being very different from those on the adult or large trees. In the seedling trees they are very narrow and radiate out like a number of thin fingers. In the adult trees the leaves become shorter and broader, and quite entire or very slightly lobed. The flowers are insignificant. The male and female flowers are distinct, but borne on the same tree, some trees bearing a preponderance of male, others a preponderance of female flowers. This accounts for the fact that some trees bear so much heavier crops of seed than others.

A very beautiful member of the Sterculia family in flower in the coastal scrubs or jungles from the middle of November till shortly after Christmas is the Flame Tree (*Sterculia acerifolia*), a tree with a wide range in its wild state from the Illawarra district of New South Wales to the Cairns district in North Queensland.

Birdwood Grass.

"INQUIRER" (Toowoomba)—

We have made some inquiries about Birdwood grass and have received a letter from Mr. C. A. Gardner, Government Botanist, Perth, Western Australia, who informs us that it is *Cenchrus biflorus* and was sent by General Birdwood to one of his sons-in-law in Western Australia. It has proved an exceedingly hardy grass of particular value for the dry, summer-rainfall areas of that State.

This Department has experimented with two species of Cenchrus, namely *C. pennisetiformis* and *C. ciliaris*. These certainly have promise for some of the northern parts of the State, and we strongly suspect that the one we grow under the name of *Cenchrus pennisetiformis* is the same as Birdwood grass. It is known here and in the Northern Territory as Buffel grass.

Flame Tree. "Peanut" Tree.

A.I.B. (Eumundi)—

1. The Flame Tree (*Sterculia acerifolia*), a native of coastal Queensland and Northern New South Wales. In some of the scrubs the trees reach a very large size. It is quite common now as a garden and ornamental tree. When in flower the tree is a very brilliant sight, but the individuals vary considerably in the amount of bloom they produce.
2. *Sterculia quadrifida*. The only local name we have heard applied to this tree is Peanut Tree. The seeds when freed of the black coatings are quite palatable nuts.

The Candle Nut.

INQUIRER (Brisbane)—

The specimens have been determined as the Candle Nut (*Aleurites moluccana*), a native of Northern Queensland and widely spread through the Pacific. It is much planted as an ornamental and nut tree in many parts of the State. The nuts are edible, but great care must be exercised in eating them as occasionally they cause severe vomiting and purging. Possibly in these cases the nuts have been in a rancid condition when eaten, but on this point we are not too sure. From personal experience one may suffer very severely from eating candle nuts at the "wrong time." The nut contains a useful drying oil, but this is nothing like so valuable as that of the allied *Aleurites Fordii* and *Aleurites montana*. Attempts to find a market here for these nuts on account of the oil they contain have never met with any success.

Eucalypts and Acacias.

J.D.P. (Calvert)—

The number of species of Eucalypts and Acacias varies as given by different authors according to their view of the limits of the species, but the following are approximately correct:—

Eucalypts in Australia	550
Eucalypts in Queensland	85
Wattles or Acacias in Australia	400
Wattles or Acacias in Queensland	130

Grasses Described.

L.W.B. (Esk)—

Brachiaria decumbens.—A perennial grass, so far as known, confined in its wild state to Uganda, tropical Africa. The genus Brachiaria is a fairly large one and practically all the species are excellent fodder plants. We have several native species in Queensland and practically all are relished by stock.

Brachiaria brizantha.—A very robust perennial species of Brachiaria, a native of tropical Africa where it is widely spread throughout Upper and Lower Guinea, through the Nile region, and through many parts of the Mozambique district. It seems to have quite good possibilities as a fodder here.

Lespedeza stipulacea.—A leguminous plant allied to the Korean Clover and Japanese Clover. We think it is the poorest of all the Lespedezas introduced, and do not consider it as having much value at all. It grows during the summer months, dying down in autumn with the approach of winter.

Chloris pycnothrix.—Rather a small-growing grass. Judging just from appearances it does not seem to possess any outstanding value, though experience alone will show what its value actually is.

Digitaria Pentzii.—A species of Woolly Finger grass. It and an allied species (*Digitaria eriantha*) seem to have quite good possibilities in Queensland as fodders, particularly for growing on some sandy lands where other grasses will not thrive. We think there is country of this type in the Esk district that graziers have found rather hard to grass, and in such places it might be well worth trying.

Pennisetum ciliare.—This is a species of Buffel grass. It is widely spread in Africa, both in South Africa and Tropical Africa, Madagascar, Canary Islands, Madeira, Sicily, and extending eastwards to India. It seems to have good possibilities in some districts.

Trees Suitable for the South Burnett.

INQUIRER (Murgon)—

Our choice for an avenue of trees for Murgon would be the so-called Portugese Elm (*Celtis sinesis*), a tree of which we have seen some beautiful examples in the Burnett district. The crown is very spreading and the tree does not grow too high. The Portugese Elm is a deciduous tree, but it loses its leaves for only a very short time in winter and makes a very dense shade during the hotter months. If you would prefer an evergreen, Tulip Trees (*Arpullia pendula*) could either be planted by themselves or alternating with *Celtis sinensis*. Other trees that would grow very well in your district and make shapely avenue or street trees are the Crow's Ash (*Flindersia australis*) and Yellowwood (*Flindersia Oxleyana*). The following are some other trees you might care to plant either as individual specimens or as avenue trees about the town:—

The Camphor Laurel (*Cinnamomum camphora*). Makes a very shapely tree but the root system is rather extensive, and when planted near private gardens residents are apt to complain that the roots rob the soil of all nutriment. A good deal of complaint has been made in this direction in Brisbane.

Jacaranda. The common Jacaranda makes a good avenue tree. It requires a little attention in its younger stages. Grafton, New South Wales, which has been called the City of Trees, is noteworthy on account of some exceptionally fine avenues of Jacarandas.

Figs. Some of the Figs would do well in your district. Probably the best is *Ficus platypoda*, the small-leaved Moreton Bay Fig, or *Ficus rubiginosa*, the Port Jackson Fig. The latter makes an exceptionally shapely tree, not too large, but like all Figs the roots are very extensive and apt to do damage to gutterings, water mains, footpaths, &c.

Pines. Some of the exotic pines make densely foliaged, evergreen trees. For planting at Murgan I should think either *Pinus longifolia* or *Pinus caribaea* would be the best. Young plants perhaps could be obtained from the nearest nursery of the Forestry Department.

A Poisonous Berry (*Solanum Seaforthianum*).

J.H.S. (Atherton)—

The specimen represents *Solanum Seaforthianum*, a native of the West Indies and Tropical America that of late years has run out and become quite naturalised in many of the rain-forest areas of Queensland. Specimens have been received at different times with the report that children have been made violently ill through eating the berries, though we do not know that any actual deaths have been reported. The berries are often accused of poisoning poultry, though, strange to say, fruit-eating birds must eat the fruits with impunity as it is evidently by them that the plant is spread. The reason why fruit-eating birds may eat the berries with impunity is said to be that the solanin is contained mostly in the seeds and these are avoided by the birds.

Wild Sorghum.

H.H. (Iveragh, N.C. Line)—

The specimen forwarded with your letter of 11th instant represents *Sorghum verticilliflorum*, commonly called Wild Sorghum, now very common as a naturalised grass along railway cuttings, cultivation headlands, or, in fact, anywhere where the ground has been disturbed. There are several closely allied Sorghums which are very difficult to tell from small pieces of the seed head. These are Sudan grass, Johnson grass, and the Wild Sorghum, but we think there is no doubt that the one you send is as determined. It is a tall-growing grass and is distinguished by its perennial root system. When the plant is dug up or pulled up buds of young shoots can be seen at the base. Johnson grass has long, white, underground runners and Sudan grass has an annual rootstock. Wild Sorghum is not a particularly good fodder plant, as from tests carried out by the Agricultural Chemist it is shown to be exceedingly strong, at practically all stages of its growth, in a prussic acid yielding glucoside. In this respect it is one of the worst of the Sorghums so far tested.

General Notes.

Staff Changes and Appointments.

Mr. Halley Atherton, of Tedlands, Koumala, has been appointed an Honorary Ranger under and for the purposes of the Animals and Birds Acts.

Mr. W. E. Burnett, Inspector of Stock, Cadarga, via Chinchilla, has been appointed also an Inspector of Dairies.

The following persons have been appointed Honorary Rangers under the Animals and Birds Acts for the protection of native fauna in the Clermont district:—Mr. Wm. R. Tindale, Manager, Craven Station, Clermont; Mr. C. D. Tindale, Manager, Pacha Station, Clermont; Mr. Thos. Salmond, Manager, Albro Station, Clermont; and Mr. G. A. Fairbairn, Manager, Logan Downs Station, Clermont.

In order to ensure the better protection of native fauna, particularly the Torres Strait Pigeon, in the Mossman district of North Queensland, Mr. Wm. R. Porter, of Mossman, has also been appointed an Honorary Animals and Birds Ranger.

Messrs. T. G. Graham (Instructor in Agriculture, Mareeba), E. F. W. Ball (Assistant Experimentalist, Brisbane), and W. J. Cartmill (Analyst, Mareeba), officers of the Agricultural Branch of this Department, have been appointed also Inspectors under the Diseases in Plants Acts.

Senior Sergeant J. A. D. Bookless, Toowoomba, and Constable M. H. Baker, Ingham, have been appointed also Inspectors under the Slaughtering Act.

Mr. J. D. W. Ogilvie, Grading Inspector, Dairy Branch, has been appointed Dairy Instructor, Department of Agriculture and Stock.

Mr. W. B. Horneman, Dairy Inspector, Rosewood, has been appointed also an Inspector under the Diseases in Stock and Slaughtering Acts.

Mr. S. A. Clayton, Inspector of Stock and Dairies, Caboolture, has been appointed also an Inspector under the Slaughtering Act.

Messrs. J. C. J. Maunder, C. R. Mulhearn, A. L. Clay, and R. Nott, Government Veterinary Surgeons, Department of Agriculture and Stock, have been appointed also Inspectors under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts.

Messrs. F. N. King and J. B. King, of Tulliwallah Station, Clermont, and Mr. A. F. Brand, Norwell, have been appointed Honorary Rangers under the Animals and Birds Acts.

On account of transfers to other centres the following Police Magistrates and Clerks of Petty Sessions have been relieved of their positions of chairmen of the local sugar cane prices Boards undermentioned:—

Messrs. A. H. Aitkin—Goondi, Mourilyan, South Johnstone, and Tully Local Boards. H. B. Carney—Macknade and Victoria. M. Gallagher—Farleigh, Marian, Plane Creek, and Pleystowe Local Boards. C. D. O'Brien—Bingera, Fairymead, Gin Gin, Millaquin, and Qunaba. J. C. Baker—Isis. F. W. Schafer—Mossman.

The following have been appointed to the vacancies thus created:—

Messrs. W. Rillie, Police Magistrate, Innisfail—Chairman, Goondi, Mourilyan, South Johnstone, and Tully Local Boards. C. B. Buxton, Police Magistrate, Ingham—Chairman, Macknade and Victoria Local Boards. T. H. Kennedy, Police Magistrate, Mackay—Chairman, Farleigh, Marian, Plane Creek, and Pleystowe Local Boards. A. H. Aitkin, Police Magistrate, Bundaberg—Chairman, Bingera, Fairymead, Gin Gin, Millaquin, and Qunaba Local Boards. J. G. Fitzsimon, Clerk of Petty Sessions, Childers—Chairman, Isis Local Board. T. W. Foran, Clerk of Petty Sessions, Mossman—Chairman, Mossman Local Board.

Similarly, Messrs. Aitkin, Carney, Gallagher, O'Brien, Baker, and Schafer, who held the appointment of Agent of the Central Sugar Cane Prices Board for the purpose of making inquiries in regard to sales and leases of assigned lands, have been relieved of such appointment, and Messrs. Rillie, Buxton, Kennedy, Aitkin, Fitzsimon, and Foran appointed to the vacancies occurring.

Mr. A. F. Moodie, Inspector of Stock, Slaughtering, and Dairies, has been transferred from Hughenden to Rockhampton.

Racecourse Mill Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Racecourse Central Mill Suppliers' Committee to make a levy of one penny per ton on all sugar-cane hauled over the Silent Grove tramline and supplied to the Racecourse Mill, such levy to be used for administrative purposes of the Silent Grove Cane Growers' Branch of the Racecourse Central Mill Suppliers' Committee.

Fifty per cent. of the growers concerned may petition for a poll on the question of making the levy, which must be lodged with the Department of Agriculture and Stock by 19th November next.

Bingera Mill Levy.

The Bingera Mill Suppliers' Committee is empowered, by Regulations issued recently, to make a levy of one farthing per ton on all sugar-cane loaded at Uping, McIlwraith, and Maroondan Sidings and supplied to the Bingera Mill, such levy to be used for administrative purposes of the Maroondan Branch of the Bingera Mill Suppliers' Committee.

Fifty per cent. of the growers concerned may petition for a poll on the question of making the levy, which must be lodged with the Department of Agriculture and Stock by 19th November next.

Barley Board Hail Insurance Scheme.

Certain amendments of and additions to the Barley Board Hail Insurance Scheme Regulations have been approved. These Regulations were passed in September, 1930, and provide for the payment of compensation to barley growers in respect of losses to crops sustained through hail storm damage. The Barley Board have requested amendments of the above to provide for the covering of crops partially out in ear, the furnishing of growers' returns, and the alteration of the conditions of appointment of umpires and payment to the Board of incidental costs when an appeal is not sustained.

The Wheat Board's Hail Insurance Regulations were similarly amended in September, 1933.

Veterinary Medicines Act Regulations.

On the recommendation of the Veterinary Medicines Board, the Regulations under "*The Veterinary Medicines Act of* 1933," which were issued in February last, have been rescinded, and new regulations issued in lieu thereof.

Banana Levy Extension.

Regulations were issued in September, 1933, under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy, at the rate of ½d. per case or 1d. per every £2 or part thereof, of the net proceeds realised from the sales of bananas marketed in the bunch from the district between Nerang and the Tweed. A regulation has been issued extending this levy for a further twelve months from 1st January, 1935.

A levy on growers of bananas in the State, excepting growers in the South Coast District (to whom a special levy applies) at the rate of 1d. for every £2 or part thereof of the net proceeds from sales, was approved in December last, and a regulation will empower the Committee of Direction of Fruit Marketing to enforce this levy for a further twelve months from 1st January, 1935.

Stanthorpe Fruit and Vegetable Levy.

A regulation approved under the Fruit Marketing Organisation Acts will empower the Committee of Direction of Fruit Marketing to enforce, for a further twelve months, the levy on growers of fruit and vegetables in the Stanthorpe area. The levy for the past twelve months has been at the rate of 1s. 6d. per ton of fruit and vegetables marketed, with a minimum of 1d. per consignment. The levy for the ensuing period, however, will be at the rate of 1s. 8d. per ton, and will be operative from 15th December, 1934.

Grade Standards for Cavendish Bananas.

An amendment of the Fruit and Vegetable Packing and Grading Regulations issued under "*The Fruit and Vegetables Act of* 1927" has been approved, which provides that the minimum length for the "Sixes" grade for Cavendish Bananas shall be 6 inches.

The regulations at present provide a minimum length of 5½ inches.

Apple Levy Regulation.

A regulation has been issued under the Fruit Marketing Organisation Acts, extending the Apple Levy Regulation, which was issued in November, 1933, for a further period of twelve months from 1st December, 1934. The levy applies to all fruitgrowers in the Stanthorpe district, and is at the rate of 1d. per bushel case of apples grown and marketed from this area. When any apples are railed from any station in the district the levy shall be computed at ¼d. per ton (40 bushel cases or 80 half-bushel cases = 1 ton). Where more than one grower contributes to any consignment, the total amount of levy in respect thereof shall be paid by such growers in proportion to the respective weights of their contributions. A minimum of 1d. shall apply for any one consignment.

Control of "Brumbies."

A Proclamation has been issued under the Diseases in Stock Acts, declaring the Cloncurry Stock District to be a district for the control of brumbies or wild horses for the period from 1st January, 1935, to 30th April, 1935.

New Containers Necessary in Trans-Border Trade.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) stated recently that considerable trouble was being experienced at Wallangarra by the holding-up of fruit and produce exported from Queensland to New South Wales because it was not contained in new cases or bags. Agents or other persons sending fruit and vegetables to New South Wales, if they wished to avoid delay at the border, and perhaps outright condemnation of their goods, must use new cases or bags in every instance, as provided by the New South Wales regulations.

An exception only was made in the case of pumpkins and onions, which could be consigned in sound, clean flour or sugar bags, provided they were accompanied by a certificate to this effect.

Papaw Levy Regulation.

A regulation has been issued under the Fruit Marketing Organisation Acts extending for a further twelve months the Papaw Levy enforced in December, 1933. The levy is operated by the Committee of Direction, and is at the rate of one penny for every four cases of papaws, or part thereof, marketed in Queensland.

Regulations under the Stock Foods Acts and the Pest Destroyers Act.

All existing Regulations under "*The Stock Foods Acts*, 1919 *to* 1928," and the Regulations under "*The Pest Destroyers Act of* 1923," have been rescinded, and new Regulations under both Acts have been issued in lieu thereof.

The new Regulations embody many of the original regulations, which have been brought up to date and generally improved.

Credit Still Rising—Australia's Position Abroad.

The report that Australian 5 per cent. loans in New York have reached par is yet another indication of the rehabilitation of Australia's credit abroad, according to an official statement issued from Canberra recently.

In American financial circles the opinion is expressed that the return of values was due to the conviction of the American public "of the complete stability of Australian economic affairs, and not to extraneous circumstances"; it is also pointed out that few other foreign issues in New York enjoy such high prices as Australian stocks.

In three years the market value of Australian 5 per cent. stocks in New York has more than doubled. They reached their lowest point on 15th December, 1931, when 5 per cent. 1957-stocks were quoted at 46. They had been falling steadily to this figure since the beginning of 1929, when they were selling at 96. They have been rising almost continuously ever since, as the following table shows:—

	5 Per cent. 1955.	5 Per cent. 1957.		5 Per cent. 1955.	5 Per cent. 1957.
15th January, 1929 ..	96½ ..	96	15th January, 1932 ..	57½ ..	57¾
15th July, 1929 ..	95½ ..	95½	15th June, 1932 ..	61 ..	61
15th January, 1930 ..	92½ ..	93	17th January, 1933 ..	76¾ ..	77⅛
16th June, 1930 ..	88¼ ..	88½	18th July, 1933 ..	83½ ..	83½
15th January, 1931 ..	68 ..	68	17th January, 1934 ..	94 ..	95
15th June, 1931 ..	64¾ ..	65	13th June, 1934 ..	94⅛ ..	94¼
15th December, 1931 ..	46⅝ ..	46	7th December, 1934 ..	100 ..	100

Bird Research in Germany.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) announced recently the receipt of a note through the Secretary of State for the Dominions (Mr. J. H. Thomas) from the German Ambassador in London regarding the activities of the German Bird Research Stations.

The Ambassador advises that more than 160,000 wild birds annually have rings attached to their feet at the two stations; the bird observatory of the State Biological Institution in Heligoland, and the Rossitte-Kurische Nehrung Bird Observatory of the Emperor William Society for the promotion of Science. Inscriptions and figures on the rings enable reports to be received from all quarters, and every year several thousand reports, from South Africa to the Arctic Ocean, reach the two bird observatories regarding their ringed birds. This work has results of scientific importance, and reveals quite new discoveries regarding bird migration and other phenomena of bird life. The two observatories are naturally very interested in receiving as large a number as possible of such reports relating to their ringed birds, and on receipt of these reports the precise information is forwarded, not only in regard to the particular case before them, but about their work generally. These observatories are prepared to compile and transmit reports which concern the ringing stations of foreign countries, and willingly supply printed matter relating to the tasks undertaken and the results of their work.

The German Ambassador is desirous that all British authorities and institutions concerned should be acquainted with the activities of their observatories, as scientific work depends on the interest and participation of the widest possible range of people. The Ambassador has given an assurance that the transmission of any notice of the finding of ringed birds to one of the two bird observatories would be gratefully acknowledged.

Egg Board Election.

The voting in connection with the election of a growers' representative for each of the Districts 2, 3, and 4 of the Egg Board resulted as follows:—

	Votes.
District No. 2 (Brisbane North-Redcliffe).	
Matthew Hale Campbell, Albany Creek	101
Raymond Harrison, The Gap, Ashgrove	38
Robert Auburn Chapman, The Gap, Ashgrove	23
District No. 3 (Brisbane South-Cleveland).	
Christian Gisler, Wynnum	130
*Tom Hallick	106
District No. 4 (Moreton).	
Johannes De Vries, Rosewood	104
*Alexander McLauchlan, Boonah	58
Henrich Jacob Jurgensen, Moogerah	42

*Present member.

Messrs. R. B. Corbett, Woombye (chairman), and W. T. Hughes, Middle Ridge, Toowoomba, were returned unopposed for the North Coast and Darling Downs respectively, and Mr. Campbell, a former Chairman of the Board, has been elected in place of the late Mr. A. A. Cousner, who previously represented the Brisbane North district.

The new Board will hold office for a term of one year as from the 1st January.

Dairy Products Stabilisation Board.

By an Order in Council issued on 8th February, 1934, the Dairy Products Stabilisation Board was constituted for a period of twelve months, and comprised the members of the Butter Board together with two members of the Cheese Board. An Order in Council has been issued to-day, amending the constitution of the Board to provide that the Board shall be continued for a further period until the 30th June next.

Rural Topics.

Sunshine Wheat Competition.

At a recent meeting of the Council of the Royal Agricultural Society of Victoria at Melbourne, the secretary reported that he had been advised by Messrs. H. V. McKay Massey Harris Pty. Ltd. that that firm had decided to continue for five years, commencing with the 1935 Melbourne Royal Show, its competition for the best bag of commercial wheat, under conditions similar to those applying to the 1934 competition, with the exception that condition No. 1 be altered to require that the exhibit shall represent a minimum of 50 acres of the variety of wheat exhibited. He had further been informed that prize money in connection with this competition would annually be: First, £8; second, £5; third, £2; with, in addition, £10 to be paid to the society through which the first prize exhibit is entered for the Melbourne Royal Show, also a suitably engraved trophy valued at £5 to be presented to the winner of the first prize. In concluding his report, the secretary drew attention to the fact that the twenty-five entries in this competition at the Centenary Show had represented wheat grown in Western Australia, South Australia, New South Wales, and Victoria.

At the instance of the president, it was unanimously decided to accept with pleasure the promised donation, and the fact that it was intended to continue the competition for five years was noted with appreciation.

This year the winners of the competition were:—1st—R. R. Wilson, Yeelanna, S.A. (variety, Ford); 2nd—A. R. Moulton, Berrigan, N.S.W. (variety, Pusa 4); 3rd—David Johnston, Dookie, Vic. (variety, Wardfir).

Wheatgrower's Records Prove Efficacy of Fallowing.

Striking proof of the efficacy of fallowing is afforded by figures published in a recent issue of the "Agricultural Gazette" of New South Wales. The figures comprise records of yields kept by Mr. W. W. Watson, of Tichborne, near Parkes, and show that, taking into account only strictly comparable years (when both fallow and stubble were cropped during the same year), stubble land averaged 12.84 bushels per acre and fallow land 19.04 bushels per acre, an increase of 48 per cent.

The statistics cover a period of thirty-one years—from 1903 to 1933. There are no exceptional circumstances or favoured conditions connected with Mr. Watson's farm, states the article, and although he farms soundly, he makes no attempt to produce record yields. Furthermore, the soil on which the crops were grown is quite average quality wheat land (a silty loam 9 in. deep, with a clay loam subsoil), while the rainfall and temperatures, as regards both degree and incidence, were such as might have been experienced in any average wheat district.

During the first period, 1903 to 1913, the land had the advantage of the natural humus content maintaining a suitable mechanical condition, and the farm yield from fallowed land was 20.6 bushels per acre. During the second period, 1914 to 1923, the humus content undoubtedly lessened and there was a tendency for the soil to set or cake and to be more difficult to work. This may have affected the yields, which showed a reduction to 17.7 bushels per acre, although the rainfall of the growing season averaged .24 inches greater than during the first period. The tendency for the soil to set, due to the lessening of the humus content, still persists (1934).

After the year 1923, a very appreciable increase in yield took place—namely, 5 bushels per acre for the ten-years' period 1924 to 1933, raising the acre yield to 22.7 bushels, even though the average rainfall during the growing seasons was .72 inches less than for the second period (1914 to 1923). This increased yield is largely attributable to the improved structural condition of the fallowed land, which from 1923 onwards conformed to the principles as at present advocated. This provides for a firm seed-bed, which is essential for a satisfactory germination and is conducive to the best results from superphosphate.

Prior to 1923 fallowed land was merely that which had been ploughed during the previous winter and kept clean until seeding time. Field competitions, commencing in the early twenties, taught the why and the wherefore of the details of fallow workings, and when these were put into practice up went the yields.

In the following table fallow-sown and stubble-sown wheat are combined, the figures thus showing the results of the whole of the wheat-growing operations on Mr. Watson's farm for the different periods. The increases in area cropped and acre yields are very striking. The yield increase is due first to a greater proportion of fallow, supplemented during the last period by a well-prepared fallow, which made soil conditions more suitable for the action of superphosphate,

and also to the introduction of better varieties, pure seed, and the copper carbonate treatment of seed wheat.

Period.	Average Area Sown.	Average Acre Yield.	Increased Yield.	
	Acres.	Bushels.	Bushels.	Per Cent.
1903 to 1913	231·5	14·9	..	..
1914 to 1923	339	16·2	1·3	8.7
1924 to 1933	565	21·1	6·2	41·6

From 1910 to 1925 Mr. Watson kept records of the yields from manured (56 lb. superphosphate per acre) and unmanured areas. Averaging the yields according to the periods shown in the above table, the increases due to the use of superphosphate were as follows:—

Period 1910-13—1.6 bushels per acre increase.

Period 1914-23—1.0 bushels per acre increase.

Period 1924-25—7.0 bushels per acre increase.

The reason for terminating the trials in 1925 was that the increases for 1924 and 1925 were so great as to indicate that further tests were unnecessary. Moreover, there was the loss each year from the unmanured areas to be considered.

The figures show that up till the end of the second period there was no appreciable increase in yield brought about by the use of superphosphate. The reason, no doubt, is that the fallows during those periods were loose and there was no compact seed-bed. With a change in fallowing methods, as demonstrated by field competitions about this time, there was an immediate response to the use of superphospsate, and Mr. Watson still assesses the increase at 6 bushels per acre.

Orchard Notes for March.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

During recent weeks there has been a marked increase in the banana thrips population in those districts in which this pest is well established. Growers who consider it necessary to deal with banana thrips are advised that so far nicotine dusts applied at weekly intervals have given the most promising results. The dusts may be applied by means of an inexpensive hand dust gun, or by a rotary duster to which a special flexible outlet pipe has been fitted.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass

has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green.

As blue mould is likely to cause heavy loss in coastal citrus, especially in long distance consignments, special precautions should be taken for minimising this loss. It must be remembered that the blue mould fungus will only attack bruised or wounded fruit. Hence it is necessary to be careful that no injuries are given by the clippers or finger nails during picking. Fruit should be cut and not pulled. Long stalks which may injure other fruit must be avoided.

The fruit must be carefully handled and accurately packed so as to avoid bruising. Any injured fruit should be discarded. In order to reduce the number of fungus spores present in the plantation all waste fruit in the orchard or packing shed should be collected at frequent intervals and destroyed by fire or burying.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5½ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to blue mould to be removed prior to despatch.

Growers are reminded that the control of the bronze orange bug is best achieved by spraying with the resin-caustic soda-fish oil mixture normally either late in March or early in April. Applied at this time of the year the spray can give a mortality of 98 per cent. of the bronze bugs which are then present solely in the very young stages. This spray is also very effective against several of the important scale insects infesting citrus.

Red scale is a pest to which citrus growers will shortly have to give attention, it being considered that control is best established from the middle of March to early in April. Fumigation with hydrocyanic acid gas is most effective against red scale, but success may also be achieved with white oils or with the resin-caustic soda-fish oil mixture evolved for the control of the bronze orange bug. Red scale, of course, is pre-eminently a pest of the hotter drier citrus districts.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where the potato crop is subject to Irish blight it is advisable to spray the plants for the control of this disease. Bordeaux mixture of 4.4.40 strength should be applied at least three times at intervals of ten days to a fortnight, commencing when the plants are about six weeks old.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for thirty-six hours and subsequently aerated and stored in airtight containers. The germination of the maize is not normally affected by this treatment if dry and mature when treated.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early-planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A MISCHIEVOUS DELUSION.

HOW often one hears the word "teething" in the conversations of mothers about their babies! Even in these days many mothers make the mistake of explaining all kinds of illnesses by saying that the baby is teething. "Only teething" is a phrase which has killed many infants, and caused many more to grow up weak and sickly. Healthy babes never show any serious disturbance of health from this cause, though rarely they may be a little restless and dribbling. When there appears to be really some pain in the gums the infant is usually feverish or ill from some other cause, and when this is removed his teeth cease to trouble him. The ailments which have been put down to teething are so many that we can mention only a few of them.

Digestive Upsets.

Perhaps these are the commonest of all. How often we hear loose, green frequent motions calmly referred to as "just teething," and how often we have to explain that the real cause is something the baby has swallowed! His mother has been overfeeding him, or giving him unsuitable food, or letting someone else do so, or he may have picked it up for himself. It happens that the teething age is the weaning age, and it is the time when these mistakes are most common. It is no help to the babe to blame his teeth, though it may comfort a careless mother, and encourage her in her foolish feeding, until the consequences become serious.

Skin Rashes.

One sometimes sees an infant with an irritable rash on the skin, most frequently in the napkin area. This might be prevented by care and cleanliness. When the mischief has been done it may be cured by simple treatment; but if the mother persuades herself that it is "just his teeth," the infant continues to suffer until it becomes so distressed that she has to see a doctor. Even measles have been put down to teething! There is no such thing as a "teething rash."

Feverish Attacks.

Babies and young children easily get feverish from all sorts of causes, but not from their teeth. The most common are the infections known as "common colds" and influenza, but there are many others, such as tonsilitis, measles, scarlet fever, diphtheria, and dengue.

Earache.

Perhaps the most serious mistake of all is to attribute earache to teething. Inflammation of the ear behind the drum is very common in

children and may occur in any of these infections. An older child may be able to tell you about the pain; the young baby cannot. He is fretful and keeps crying and perhaps pulling at his ears. At night he may be restless, rolling his head on the pillow, and frequently waking with sharp cries of pain. Unless promptly treated, an abscess forms and the child may be very sick indeed. When this bursts there is a discharge of matter and the pain is relieved. It is then a serious responsibility to see that the ear heals rapidly and completely and does not become a cause of deafness and a menace to the child's future health.

IN THE FARM KITCHEN.

JAM MAKING.

IN order to get the best results, good fruit in the best condition must be used. The fruit must be ripe, but not over-ripe; jam made from green peaches or imperfect fruit of any kind may be fit to use, but it does not keep well and cannot be compared with a preserve made from properly developed and fine fruit.

All fruits must be thoroughly cleaned.

Citrus fruits, pie melons, and rosellas should be prepared the day before the jam is made.

Apricots, nectarines, and peaches must be carefully peeled and stoned; the kernels of about one-quarter of the stones should be blanched and added to the fruit after the sugar has been added.

Plums must not be peeled; the stones may or may not be removed.

Berries such as gooseberries, mulberries, raspberries, and strawberries should be washed and dried carefully.

Fruit prepared the previous day must be kept in earthenware dishes; piemelons should be sprinkled with a small amount of sugar and allowed to stand for 12 hours; citrus fruits when cut up should be kept in earthenware dishes; a small quantity of water should be added; the seeds and stalks of rosellas are removed and kept in one dish; the remainder of the fruit is placed in another dish.

To all fruits sufficient water is added to prevent the fruit sticking to the preserving pan.

Berries and sugar are placed in the pan together; these fruits should not be stirred in such a way that they are mashed or broken.

In making jam from apricots, citrus fruits, melons, peaches, pears, pineapples, plums, quinces, and rosellas the fruit must be boiled till tender before the sugar is added. The cooking must be slow.

The amount of sugar to be used varies from half a pound to one pound to the pint of cooked pulp; it depends upon (*a*) the kind of fruit; (*b*) its condition.

Scum rises freely while some fruits are being cooked; if it forms a thick toughish layer it must be removed.

The time required for cooking varies; in the case of berries the time must not exceed 30 minutes; apricots, damsons, and firm peaches require one hour; melons, pear, pineapples, and quinces may require two hours before the sugar is added, and from half an hour to one hour afterwards. Cooking is completed if a small portion of the fruit sets when dropped from a spoon on a cool surface.

If jam or jelly is boiled too long it will not set.

Most jams should be bottled and sealed down while hot; jams made from berries should be allowed to cool before bottling if bottled while hot the berries rise to the top of the bottle.

Bottles may be covered with white paper dipped in white of egg or boiled starch; if corks are used they should be dipped in melted wax and forced into the bottle, the top should then be covered with wax. If the bottles have lids, care must be taken to screw them down tightly.

In dry sunny weather jam made from first class fruit, after bottling, may be allowed to stand for 24 hours before being sealed; the bottles should be covered with cheese cloth to keep off dust; a layer of melted parowax should then be poured over the surface in each bottle; the bottles may be covered with paper; preserves treated in this way should keep for months.

Apricot Jam.

Materials—Apricots; 1 lb. crystallised sugar to each pound of fruit weighed without kernels.

Utensils—Knife; dish; preserving pan; saucepan; basin; jam jars; wooden spoon.

Method—

1. Peel apricots; cut them into halves.
2. Remove stones; crack stones and remove kernels.
3. Put ¼ of the kernels into cold water; bring to boil and peel.
4. Put apricots and sugar into a bowl in layers; allow fruit to stand 12 hours.
5. Put fruit and syrup into preserving pan with remainder of sugar, blanched kernels, and water.
6. Allow to cook slowly until apricots are soft and transparent.
7. When slightly cool pour into warm jars.
8. Cover down air-tight.

Note.—Apricot jam may be made without peeling apricots.

Apricot Jam made from Dried Apricots.

Materials—1 lb. dried apricots; 8 cups boiling water; 8 cups sugar; 3 lemons; 6 blanched almonds.

Utensils—Bowl; cup; wooden spoon; squeezer.

Method—

1. Put apricots into a bowl; cover with cold water.
2. Wash fruit well; drain; cut fruit into halves; return apricots to bowl.
3. Cover with boiling water; allow to stand till the apricots are well soaked and plump.
4. Put fruit and water into a preserving pan.
5. Boil till the fruit is clear; add sugar, lemon juice, and almonds.
6. Boil till a small quantity jellies on a saucer.
7. Bottle; seal; cover securely.

Note.—Any dried fruit may be used in this way.

Cape Gooseberry Jam.

Materials—1 lb. of sugar to each pound of fruit.

Utensils—Bowl; sieve; cloth; preserving pan; wooden spoon; jars.

Method—

1. Wash fruit; pick it over carefully; drain and dry fruit.
2. Bruise some ripe berries in the bottom of the preserving pan.
3. Boil for 15 minutes; add remainder of fruit.
4. Add sugar; boil for 1 hour.
5. Let the jam stand in the preserving pan till it is cool.
6. Bottle and cover.

Fig Jam.

Materials—Water; salt; ¾ lb. sugar to each pound of pulp and pint of water; to each pound of figs the juice of 1 lemon and grated rind of ½ a lemon.

Utensils—2 bowls; knife; preserving pan; wooden spoon; lemon squeezer; grater; cup; bottles or jars; corks; covers, or paper.

Method—

1. Cut off half the stem of firm ripe figs; soak them for 12 hours in water to which a little salt has been added.
2. Drain; wash in warm water; split the fruit in halves.
3. Put ¾ lb. sugar and 1 pint of water for each pound of fruit into a preserving pan.
4. Add lemon rind and juice; allow to boil for 10 minutes.
5. Add figs; boil until the fruit is clear.
6. Bottle while hot; cover securely.

Note.—Instead of lemons, pineapple may be added in making this jam, in the proportion of 1 lb. pineapple to 3 lb. figs.

Grape Jam.

Materials—5 lb. grapes, 2½ lb. sugar.

Utensils—Preserving pan; jam jars; wooden spoon; skimmer.

Method—

1. Wash firm, under-ripe grapes.
2. Put fruit and sugar in layers into a preserving pan, allowing ½ lb. of sugar to 1 lb. fruit.
3. Set pan near fire until juice flows.
4. Boil, stirring occasionally.
5. Remove seeds as they rise.
6. When half a teaspoonful jellies on a cold plate, remove from fire.
7. Allow to cool a little; bottle in warm jars; cover down air-tight.

Note.—If the skins are touch and seeds are plentiful, this jam may be rubbed through a coarse sieve.

Isabella Grape Jam.

Materials—Partially ripe Isabella grapes; 1 cup of sugar to each cup of skin and pulp.

Utensils—Preserving pan; bowl; cup; wooden spoon; jars.

Method—

1. Squeeze the pulp out of the skins.
2. Boil the pulp and seed until seeds are separated from pulp.
3. Strain through a colander to remove seeds.
4. Measure skins and trained pulp.
5. Put skins, pulp, and sugar into a preserving pan.
6. Boil until a small quantity jellies on a cool surface.

Melon and Pineapple Jam.

Materials—Piemelon; pineapple; ¾ lb. sugar to each lb. of pulp.

Utensils—Preserving pan; knife; cup; jars.

Method—

1. Cut off pineapple ends; break pulp from core with a fork.
2. Peel melon; cut pulp into pieces, removing seeds.
3. Put melon into a preserving pan; add enough water to keep the pulp from burning.
4. Boil till tender; measure melon and pineapple.
5. Add ¾ cup of sugar to 1 cup of pulp.
6. Boil till a small quantity allowed to drop on a plate sets.
7. Put into jars; cover; label.

CITRUS FRUITS IN THE KITCHEN.

Orange Delight.—Peel and remove the pith of six oranges. Slice thinly in rings, removing the seeds. Arrange in a glass dish or a pyrex, and sprinkle with sugar. Pour a rich boiled custard over the top. Make a meringue with the whites of eggs and head it on top of custard, then garnish with grated orange peel. Set meringue in oven; stand the glass in pan of water while in the oven.

Orange Quarters.—Take three oranges, ½ teaspoon citric acid or juice of two lemons, 2 cups hot water, 1 tablespoon brandy or sherry, little cochineal, and 3 dessertspoons gelatine. Cut oranges in halves, scoop out centre, leaving only the skins; do not break them. Dissolve gelatine, sugar in hot water, add acid or lemon juice, sherry or brandy, and colour half the mixture wtih a few drops of cochineal. When cool pour mixture into shells or skins, and allow to set. Serve on a bed of green leaves.

Orange Compote.—Take ½ pint of water, ½ lb. sugar, and six oranges. Peel oranges, divide into sections, boil sugar and water with shreads of orange peel. Take out the peel and put the orange sections in the syrup and simmer gently ten minutes. Take out and arrange in a glass dish. Add a couple of sheets of gelatine dissolved in water to the syrup and allow syrup to cool a little; then pour over the oranges.

Lemon Trifle.—Items required are 3 cups water, 1½ cups sugar, juice and rind of two lemons, 2 tablespoons arrowroot, and whites of two eggs. Boil the water, sugar, and lemon juice together, then add the blended arrowroot, and when cooked add the stiffly-beaten whites. Serve cold with custard made from yolks.

Orange or Lemon Shape.—Take 3 eggs, ½ oz. gelatine, 2 oz. sugar, cup of hot water, rind of a lemon grated, and juices 2 oranges or lemons. Soak gelatine in hot water, whip whites of eggs till stiff; gradually pour on gelatine and water, beating all the time, beat yolks and add sugar, beat all together. Pour into a wet mould till set.

THE PREPARATION OF CHUTNEYS.

In chutney making there is scope for individual taste and ingenuity in combining different ingredients to give a distinctive flavour. Acid fruits, such as apples, gooseberries, plums, ripe tomatoes and green tomatoes are bases for chutney, and onions, garlic, raisins, dates, sugar, spices, are added according to taste, and the whole mixed with vinegar. The vinegar and the spices are the preserving agents. A good chutney, whatever the ingredients, should be smooth to the palate, and should have a mellow flavour. To obtain this result, it is necessary to cut up all the ingredients finely, and to cook them very slowly for two hours or longer. Long and slow cooking is essential. The addition of raw materials, such as chopped onion or garlic immediately before the chutney is bottled is not advisable, as they destroy the smooth texture and do not give such a good flavour as when cooked with the other ingredients. It is sometimes necessary to put certain ingredients through a sieve, and in that case a hair one should always be used, as metal sieves usually give an unpleasant metallic taste to the chutney. For this reason also, the use of brass, copper, or iron pans during the preparation should be avoided; enamel-lined, monel metal or aluminium pans should be used.

In bottling chutney, the bottles should be clean, dry and hot. The chutney should be bottled hot, and the bottles immediately sealed. If they are to be sealed by means of bladder or parchment paper, however, the chutney should be allowed to cool down before sealing. If corks are used, they should be heated in hot water at about 170 deg. F., and then covered with a circle of grease-proof paper and placed in the bottle or jar. The seal may then be dipped in melted paraffin wax to make the cork airproof. If metal-capped jars are used, wax circles, such as are used for jam, should be inserted between the metal and the chutney.

Gooseberry Chutney Recipes.

(1) 1½ lb. gooseberries	½ oz. salt
3 oz. stoned raisins	¼ oz. mixed spice
5 oz. sugar	¼ oz. crushed mustard seed
4 oz. onions	½ pint vinegar

The onions should be chopped and cooked in a little water till tender, and the water drained off. The gooseberries should be topped, tailed and washed, placed in a pan and the cooked onions, raisins, crushed mustard seed, spice, salt, and vinegar added. The chutney should be simmered for an hour or until it is of thick consistency.

(2) 3 lb. green gooseberries	2 tablespoonsful salt
¾ lb. stoned raisins	½ teaspoonful cayenne
2 lb. brown sugar	½ teaspoonful turmeric powder
2 tablespoonsful mustard seed	3 onions
2 tablespoonsful ground ginger	2 pints vinegar

The onions and raisins should be chopped, the gooseberries topped and tailed, and the mustard seed crushed. All the ingredients should be put into a pan, brought to boiling point and simmered slowly for 1½ hours or until the ingredients are quite tender.

Apple Chutney Recipes.

(1) 6 lb. apples	¼ teaspoonful cayenne
2 lb. onions	2 heads garlic
3 lb. brown sugar	Salt to taste
½ lb. preserving ginger	4 pints vinegar

The apples should be peeled, cored, and cut up into very small pieces and the onions sliced very finely. All the ingredients should be mixed with the vinegar in a preserving pan and boiled gently for 2½ hours or until the chutney becomes very thick.

(2) 7 lb. green apples	1 oz. garlic
2 lb. sultanas	1 teaspoonful spice
4 lb. brown sugar	1 teaspoonful salt
1 lb. preserving ginger	1 quart vinegar
1 teaspoonful cayenne	

The apples should be peeled and sliced and boiled with the brown sugar until fairly thick. The choped ginger, sultanas, garlic, and spices should be added and boiled for twenty minutes. The vinegar should then be mixed in and simmered until the mixture has the requisite consistency.

(3) 4 lb. green apples	½ lb. preserved ginger
1 lb. raisins	1 pint vinegar
½ lb. sugar	

The apples, raisins, and ginger should be chopped very finely; the sugar and vinegar added, brought to boiling point and simmered till of thick consistency.

Marrow and Apple Chutney.

2 lb. marrow	½ lb. sugar
½ lb. shallots	½ oz. bruised whole ginger, chillies, and peppercorns
1 lb. green apples	1½ pints vinegar

The marrow should be cut into small pieces and placed in a basin with salt between each layer, left for twelve hours, and then drained well. The marrow, apples, and onions should be chopped finely; the spices tied in muslin; and the ingredients, except vinegar, put in a saucepan and cooked until tender; the vinegar should then be added, and the chutney cooked until it reaches the consistency of jam.

Green Tomato Chutney Recipes.

(1) 4 lb. green tomatoes	12 red chillies
1 lb. apples	2 oz. garlic
½ lb. stoned raisins	1 lb. shallots
1 lb. brown sugar	1 pint vinegar
½ oz. bruised ginger	

The tomatoes should be sliced, the apples, shallots, and raisins chopped, and all the ingredients placed in a pan, brought to the boil, and cooked until the chutney has the consistency desired.

(2) 5 lb. green tomatoes	1 saltspoonful cayenne
3 lb. green apples	½ teaspoonful cloves and peppercorns
1 lb. moist sugar	¼ saltspoonful cinnamon
1½ lb. chopped onions	1 quart vinegar

The tomatoes should be peeled and sliced, placed in a basin with salt between each layer, left for twelve hours and then drained. They should then be placed in a saucepan with the other ingredients, brought to the boil and simmered until quite tender.

(3) 1 lb. green tomatoes or apples	¼ lb. preserved ginger
½ lb. onions	¼ oz. cayenne
2 bananas	1 oz. salt
½ lb. raisins	¾ lb. brown sugar
	1¼ pints vinegar

The tomatoes and bananas should be sliced, the onions, raisins, and ginger chopped and all ingredients placed in a pan, brought to the boil and simmered slowly until of a thick consistency.

Ripe Tomato Chutney.

Spiced vinegar	12 lb. tomatoes
1 pint vinegar	1½ lb. sugar
¼ oz. cinnamon bark	1½ oz. salt
¼ oz. whole allspice	Pinch cayenne
¼ oz. Penang cloves (stalks only)	¼ oz. paprika
¼ oz. blades of mace	2 fluid oz. Tarragon or Chili vinegar

The spices (tied in muslin) should be added to the vinegar, brought to the boil and allowed to infuse for two hours. The tomatoes should be blanched for one minute in boiling water, the skins and hard cores removed, cut up, and simmered until a thick pulp is obtained. The other ingredients should be added and the strained spiced vinegar. The chutney should be cooked until it is of a very thick consistency.

Date Chutney.

1 lb. stoned dates	½ oz. garlic
¼ lb. stoned raisins	¼ oz. salt
¼ lb. shallots or onions	6 red chillies
¼ lb. sugar	1 pint vinegar

The dates, raisins, and onions should be chopped finely, put in a pan with the other ingredients, and boiled until tender.

TO STIMULATE DECOMPOSITION.

If a compost heap of garden refuse is being formed, a mixture of ammonium sulphate two parts, ground rock phosphate one part, and ground limestone one part is a good decomposing mixture. Use about 2 cwt. per ton of refuse.

TO CLEAN SUPER. BAGS.

Soak in lime water. Sulphuric acid will combine with the lime to form sulphate of lime (gypsum), which is harmless to the bags and almost insoluble. A wash afterwards in clean water should remove practically all the gypsum and leave the bags suitable for most purposes.

TO UNSCREW WATER-TAPS.

Tank-taps can be unscrewed for repairs with little waste of water. Partly fill a strong sugar-bag with sand, tie it firmly to a long pole, and lower into tank till it can be pressed firmly against tap aperture; then unscrew the tap. Pressure of water will force the sandbag into the hole, closing it till the tap has been repaired. In this way also the extra piping can be attached to the tank without waiting till it is empty.

LOOSE LAMP-TOPS.

To fix metal tops on kerosene lamps, scrape all the old cement from brass top and glass reservoir, and wash both well in soapy water to remove the kerosene. Make a smooth paste (about as thick as butter) of plaster of Paris and water, spread it thinly on brass and glass, and put the socket firmly into position. See that it is straight, as the plaster sets quickly. Wipe off any which oozes out on the glass. Mended in the morning, the lamp can be filled and used same night. A tablespoonful of plaster will mend three or four lamps, but mix only for one at a time.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING DECEMBER, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.,	No. of Years' Records.	Dec., 1934.	Dec., 1933.
North Coast.	In.		In.	In.
Atherton	7·60	33	0·69	7·60
Cairns	9·03	52	1·45	7·65
Cardwell	8·44	62	1·35	22·03
Cooktown	6·83	58	1·03	6·23
Herberton	5·87	48	1·94	4·43
Ingham	7·21	42	0·77	18·50
Innisfail	12·20	53	0·39	18·92
Mossman Mill ..	11·25	21	1·82	11·39
Townsville	5·64	63	0·80	11·41
Central Coast.				
Ayr	4·10	47	0·13	2·38
Bowen	4·48	63	1·50	3·73
Charters Towers ..	3·38	52	0·22	1·77
Mackay	7·26	63	2·07	5·75
Proserpine	8·11	31	2·29	4·81
St. Lawrence ..	4·81	63	5·41	3·41
South Coast.				
Biggenden	4·59	35	9·04	6·74
Bundaberg	5·06	51	5·21	9·48
Brisbane	4 95	83	9·82	5·20
Caboolture	5·29	47	7·16	12·39
Childers	5·69	39	4·99	9·96
Crohamhurst ..	6·92	40	..	16·24
Esk	4·71	47	6·71	5·56
Gayndah	4·15	63	6·84	2·87
Gympie	6 04	64	8·11	9·24
Kilkivan	4·51	55	8·40	6·72
Maryborough ..	5·09	63	6·96	9·67
Nambour	6 97	38	7·65	13·71
Nanango	3·83	52	5·45	4·21
Rockhampton ..	4·85	63	3·55	4·00
Woodford	5·69	47	4·00	11·15
Central Highlands.	In.		In.	In.
Clermont	3·92	63	0·91	1·97
Gindie	2 84	35	1 85	0·95
Springsure ..	3·23	65	5·50	0·86
Darling Downs.				
Dalby	3·23	64	8·43	2·24
Emu Vale ..	3·49	38	5·37	3·70
Hermitage ..	2 92	28	3 50	2·40
Jimbour	3·19	46	7·88	1·87
Miles	3·07	49	8·37	3·02
Stanthorpe	3·54	61	6·47	5·14
Toowoomba ..	4·42	62	7·38	4·43
Warwick	3·40	69	5·07	3·68
Maranoa.				
Roma	2·51	60	4·70	1·18
State Farms, &c.				
Bungeworgorai ..	2·91	20	4·95	0·92
Gatton College ..	3·65	35	..	4·48
Kairi	6·52	20	1·80	9·70
Mackay Sugar Experiment Station	8·41	37	1 82	5·72

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—DECEMBER, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means.		Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·77	93	71	103	7,9,27	60	7	103	3
Herberton	..	87	62	96	26	49	11	194	2
Rockhampton	29·82	91	69	96	30,31	61	3	355	10
Brisbane	29·85	82	65	97	31	58	11	982	16
Darling Downs.									
Dalby	29·82	84	60	92	8	44	2	843	11
Stanthorpe	..	77	54	87	19	40	2	647	15
Toowoomba	..	78	58	86	8,16,20	47	1	738	14
Mid-Interior.									
Georgetown	29·79	99	72	106	26,31	61	11, 31	35	2
Longreach	29·78	101	68	109	23	54	1	5	1
Mitchell	29·81	91	61	99	8,17,18, 20	49	1	165	8
Western.									
Burketown	29·79	99	76	110	26	68	3	0	..
Boulia	29·80	101	72	112	23	58	2, 3	0	..
Thargomindah	29·80	95	70	110	16,17	58	9, 10	85	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February. 1935.		March. 1935.		MOONRISE. Feb., 1935.	MOONRISE. Mar., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·25	6·46	5·45	6·25	2·10	12·56
2	5·26	6·45	5·45	6·24	3·16	2·2
3	5·27	6·45	5·46	6·23	4·26	3·12
4	5·27	6·44	5·46	6·21	5·41	4·22
5	5·28	6·43	5·47	6·20	6·46	5·31
6	5·29	6·43	5·48	6·19	7·56	6·37
7	5·30	6·42	5·48	6·18	9·1	7·44
8	5·30	6·42	5·49	6·17	10·7	8·51
9	5·31	6·41	5·50	6·16	11·8	9·57
10	5·32	6·40	5·51	6·15	12·13	11·1
					p.m.	
11	5·33	6·39	5·51	6·13	1·12	12 noon
						p.m.
12	5·33	6·39	5·52	6·12	2·9	12·57
13	5·34	6·38	5·52	6·11	3·3	1·47
14	5·35	6·37	5·53	6·10	3·52	2·38
15	5·36	6·36	5·54	6·9	4·36	3·15
16	5·36	6·36	5·54	6·8	5·14	3·49
17	5·37	6·35	5·55	6·7	5·46	4·21
18	5·38	6·34	5·55	6·6	6 18	4·48
19	5·39	6·34	5·56	6·5	6·48	5·17
20	5·39	6·33	5·56	6·4	7·17	5·47
21	5·40	6·33	5·57	6·3	7·45	6·19
22	5·41	6·32	5·57	6·2	8·13	6·51
23	5·42	6·31	5·58	6·1	8·48	7·25
24	5·42	6·30	5·58	6·0	9·24	8·5
25	5·43	6·29	5·59	5.59	10·6	8·53
26	5·43	6·28	5·59	5·58	10·56	9·47
27	5·44	6·27	6·0	5·57	11·53	10·46
28	5·44	6·26	6·0	5·55	..	11·48
29			6·1	5·54		a.m.
30			6·1	5·53		12·54
31			6·2	5·52		2·4

Phases of the Moon, Occultations, &c.

4 Feb.	● New Moon	2 27 a.m.
10 ,,	☾ First Quarter	7 25 p.m
18 ,,	○ Full Moon	9 17 a.m.
26 ,,	☽ Last Quarter	8 14 p.m.

Perigee, 4th February, at 9.24 a.m.
Apogee, 18th February, at 9.12 p.m.

Mercury, on 1st February, will be at its greatest elongation, 18 degrees east of the Sun. This will enable it to remain above the western horizon almost an hour after sunset.

Although a partial eclipse of the Sun will occur about 3 o'clock in the morning of the 4th, it will, of course, be invisible in Australia, but at Montreal, where it will occur about midday on the 3rd, local time, not quite half of the Sun's face will be obscured by the Moon.

The Moon will pass from west to ease of Saturn 4 degrees on its northern side at 4 a.m. on the 5th, 2¼ hours before rising at Warwick. Five hours later it will pass 2 degrees north of Mercury and 5 degrees to the northward of Venus at 1 p.m. on the 5th.

Mercury will get almost in a line with the Sun on the 17th, but being 3 degrees farther north there will be no possibility of a transit.

Saturn, on the 20th, will be on the far side of its orbit, about 886 million miles beyond the Sun, and almost in a line with it, and, of course, entirely invisible.

On the 25th, when the Moon rises at Warwick (10.6 p.m.), it will be followed 13 minutes later by Jupiter, 6 degrees further north.

When Mars reaches Right Ascension 13.35 on the 27th, it will become stationary and then retrograde, getting back to Right Ascension 13.30 on the 14th March, almost the same place as on 13th February.

Mercury sets at 7.44 p.m. on the 1st, and at 6.46 p.m. on the 14th.

Venus sets at 7.48 p.m. on the 1st, and at 7.54 p.m. on the 14th.

Mars rises at 10.16 p.m. on the 1st, and at 9.34 p.m. on the 14th.

Jupiter rises at 11.46 p.m. on the 1st, and at 11.0 p.m. on the 14th.

Saturn sets at 7.46 p.m. on the 1st, and at 6.59 p.m. on the 14th.

The Southern Cross, which was at VI. at 6 p.m. on 1st January, and did not come into view till about 9 p.m., will be two hours earlier this month, and be visible all night.

5 March	● New Moon	12 40 p.m.
12 ,,	☾ First Quarter	10 30 a.m.
20 ,,	○ Full Moon	3 31 p.m.
28 ,,	☽ Last Quarter	6 51 a.m.

Perigee, 4th March, at 9.54 p.m.
Apogee, 17th March, at 2.36 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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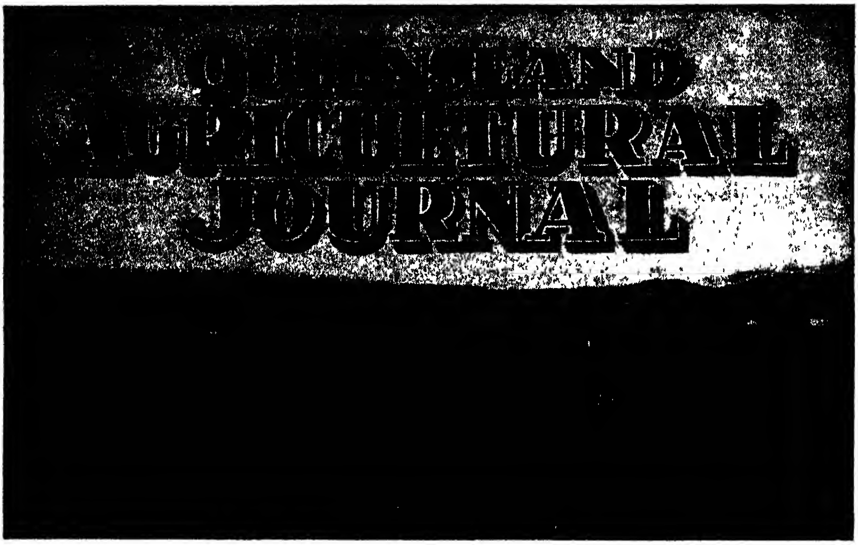

VOL XLIII. 1 MARCH, 1935. PART 3

Event and Comment.

Minister's Talk to Dairy Leaders.

"MY experience has been that we have achieved more by taking the farmers into our confidence, by showing them the road we are trying to tread, by inviting their co-operation and assistance in co-ordinating the activities of the Department with those of rural industry. Generally speaking, we wish to link up the work done on the farm, at the factory, and within the Department of Agriculture and Stock." With those remarks, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, prefaced a very interesting address to dairy leaders of several local producers' associations who, at the invitation of his Department, had assembled in Brisbane last month to undergo a brief course of instruction in departmental activities, in relation to the dairying industry particularly.

Continuing, Mr. Bulcock said that in the course of their visit to the several branches of his Department the dairy leaders would be afforded every opportunity of meeting his technical officers, and of seeing many things of interest and of great importance to their industry. Departmental officers, as employees of the State, would give them every facility for observing something of the work of the Department and answer every reasonable inquiry. Although everything at present possible to assist or direct the dairying industry was being done, he would welcome any suggestions for improving the position and conditions of the industry the dairy leaders might be prepared to submit. There were

some things, of course, entirely within the control of the dairy farmers themselves, especially in respect of hygiene and sanitation, and those things he commended for their attention as members of local producers' associations. Then there were pathological problems to be faced—problems of the utmost economic importance—and in that work they were assured of the practical assistance of veterinary and other officers. While many farmers might be prepared to do everything possible within their means to combat stock diseases, the checking or eradication of those diseases was obviously a matter for community rather than individual effort. The co-operation of every unit in the industry was therefore most desirable. It had been thought, in some instances, that his Department had been too rigorous in its campaign for better dairy cattle and for improved methods generally, but he believed that his hearers would agree with him—privately, at any rate—that there was a tremendous amount of avoidable economic loss in the dairying industry. It was their business, as far as practicable, to assist in the prevention of a continuance of that loss.

As an example of the necessity for full co-operation of all engaged in the industry, whether as producers or technologists, Mr. Bulcock cited the case of Denmark. That country, he said, delivered 136,000 tons of butter on to the British market every year, although it was Britain's tenth best customer, while Australia was Britain's third best customer for manufactured goods. In face of that fact, however, there was a movement in progress to restrict still further the imports of Australian dairy produce into Great Britain. There was every reason to feel concerned, he said, with the effect on Dominion trade of the seven or eight trade treaties entered into by Great Britain since the Imperial Conference at Ottawa with certain European countries, and which involved trade concessions to them on the British market. Apparently Denmark, to mention one of those countries, realised that next year when the existing treaty terminated the whole question of Britain's imports would be reviewed, and so was busy culling out her dairy herds with the object of achieving the highest degree of economy possible in dairy production. In the near future, therefore, Danish exporters would be able to tell the British consumer that they were in a position to offer butter with a guarantee that it was the product of disease-free cows bred, fed, and housed under the most hygienic conditions. In Mr. Bulcock's opinion, it was one of the cleverest forms of trade propaganda, based on a determined clean-up campaign in the Danish dairying industry, that had come under his notice. To the Australian producer the moral was obvious. Brains had to be met with brains, and the only effective reply to a trade competitor was the supply of an equal or better quality product.

Work of the Animal Health Station.

CONTINUING, Mr. Bulcock said that his Department was persisting in its efforts in the direction of the eradication, or at least control, of stock diseases within the State. Until recent years, the Animal Health Station at Yeerongpilly had been merely a place for the preparation of vaccines, toxins, and anti-toxins, and the treatment of redwater in cattle. It seemed to him when he assumed office that the station could be made of much greater service to stockowners, and to that end the work of the station had been reorganised and extended. A veterinary staff had been appointed and modern equipment provided. A system of refresher courses in animal husbandry for the field staff of the Dairy Branch had been instituted, so that the most recent knowledge in dairy

science might be made available to the farmer through the instructional and inspectional services. A disease-free herd campaign had been inaugurated, which, through the co-operation of the dairy farmers, had already produced sound results. The general veterinary staff of the Department had been greatly strengthened and, with the assistance of the farmers, they should be able to build up a system of dairy practice in Queensland which they could all regard with very great pride. In its relation to an industry of first importance in the economy of this country, every effort that had been made and planned, based as it was on modern dairy science and practice, had been well worth while.

High Quality in Dairy Products Demanded.

DISCUSSING the needs of the export market, Mr. Bulcock said that the Government had in view the establishment of a dairy laboratory to serve the needs of the industry. In that laboratory would be installed the most modern equipment. It was regarded as sound economy to extend scientific research in relation to such an important Queensland industry. No single unit of the industry, however, could alone solve its problems of either production or marketing; the co-operation of all—the Department, the factory, and the farm—was essential. After all, it was the producer who formed the foundation of any industry, and all the organisation and all the planned schemes would be useless without the co-operation of the people who were primarily concerned. That was why he had invited leaders of the dairying industry to visit his department and see for themselves what was being done for the men on the land, and so appreciate the call for the farmers' earnest co-operation. With animal-disease control, the production of the highest quality butter and cheese, co-ordination among every section and the co-operation of the producer, they would have nothing whatever to fear in the future of the dairying industry in Queensland.

Selling our Scenery.

EVERY district has some natural feature or some charm of landscape that would attract visitors from other parts of the State, and also from other parts of the Commonwealth, if they knew anything about it. So the question presents itself—a question well worth consideration by every local association—why not sell our scenery? Local patriotism—not to be confounded, of course, with narrow provincialism—can be a very fine thing and, rightly expressed with befitting enterprise, can have a definite material value. Tasmania, for instance, is said to derive more than a millions pounds in money every year from her tourist trade. The result is that the Tasmanian is definitely tourist-minded. He "boosts" his State wherever he goes, while the home-staying Apple Islander has developed a natural courtesy and kindliness that the stranger within his gates remembers long after the landscape delights of a beautiful country have become blurred through their mergence with later memories. According to the Canadian Bureau of Statistics, in 1929 tourists spent in the Dominion no less than £61,875,000. That enormous sum, however, shrunk during lean years to £22,000,000 in 1933. Of the Canadian tourist traffic the Bureau says: "Of all our export commodities only wheat and paper rank with it in importance," and since the fall in price of those commodities "it has surpassed both." Plainly, then, a country blessed with all the natural advantages—some of them unique—which Queensland possesses is blind to its own interests if it does not do everything in its power to attract visitors.

Root Knot Nematode and its Control.

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

CERTAIN species of nematodes or eelworms attack living plant tissue, some are parasitic on animals, while others are predaceous on nematodes themselves. The species of outstanding importance in Queensland is the common root knot nematode, so called because of the characteristic swellings produced on the roots of infested plants. This species reaches its maximum abundance in light sandy soils in the warmer portions of the State, heavy soils being much less favourable to its development, while soils that are either generally very wet or abnormally dry are usually lightly infested. Many important economic plants are susceptible to attack, but most grasses, maize, wheat, barley, broom millet, sorghum, peanuts, velvet beans, and certain varieties of cowpeas are either immune to attack or the infestation thereof is so slight as to be of no consequence. Heavy infestation in highly susceptible plants produces a marked dwarfing as a result of the disorganisation of the normal functions of the root system. Furthermore, such plants are decidedly less healthy in appearance than unifested plants; they wilt readily during hot dry weather, and generally the duration of their productive life is greatly curtailed.

Life History and Habits.

The female nematode assumes a pear-shaped appearance when full grown and then measures one-thirtieth of an inch in breadth, but the male nematode retains its worm-like appearance throughout life. The extremely minute eggs, of which as many as 500 may be laid by a single female, have a very tough shell which assists survival should adverse conditions prevail in the soil. The small thread-like nematodes emerge from these eggs at the end of the usual incubation period, and move about the soil in search of suitable host plants. These having been located the nematodes select young feeding roots and enter them generally near the tips. Feeding proceeds within the root tissue, and as a reaction to the infestation of the roots the very characteristic galls are produced. Swollen malformed areas occur throughout the root system of infested plants (Plate 107, figs. 1 and 3), and the swellings may either occur singly and only here and there on the roots or, on the other hand, the infestation may be of such intensity as to give practically the whole root system a swollen appearance, some roots bearing a marked resemblance to a chain of beads. Infestation is not always confined to the root system, for in the case of potatoes the tubers may be badly attacked, the surface thereof bearing a number of swellings (Plate 107, fig. 2) which impart a distinctly pimply appearance to the potatoes.

Other swellings may occur on the roots of plants belonging to the pea and bean family, but these are quite different in origin, being the beneficial bacterial nodules (Plate 107, fig. 4) characteristic of that group of plants. They are usually spherical in shape and small or moderate in size and can generally be easily detached from the sides of the roots on which they have developed. The nematode root galls cannot be so removed and are, of course, wholly undesirable. Both bacterial nodules and nematode root galls may occur on the roots of members of the pea and bean family.

FIG 1.

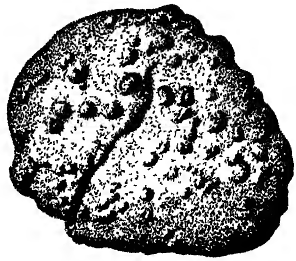

FIG 2

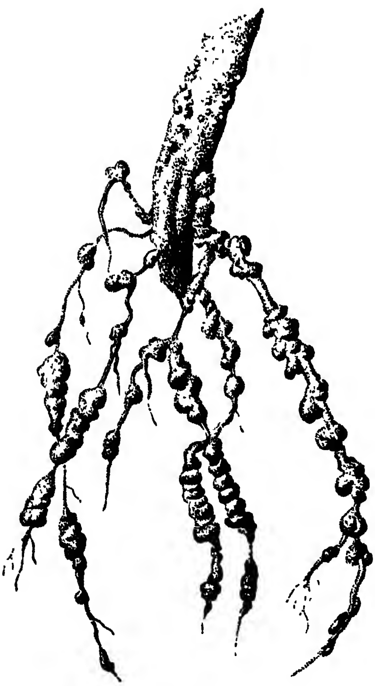

FIG. 3

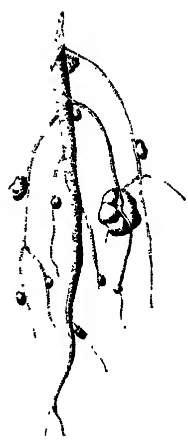

FIG 4.

PLATE 107.—ROOT KNOT NEMATODE.

Fig. 1.—Nematode galls on Strawberry roots.
Fig. 2.—Nematode-infested Potato.
Fig. 3.—Tomato root infested by Nematodes.
Fig. 4.—Bacterial Nodules on roots of Lupin.
(All half natural size.)

Control.

The control of the root knot nematode is an extremely difficult matter, because for the greater part of its life the nematode is securely entrenched within the tissue of its host plant. It does, of course, occur in the soil apart from the root tissue, and soil fumigation can dispose of large numbers of the temporarily free living nematodes. So far, however, no system of soil fumigation has been used in this State which would be economically practicable, as well as effective on an ordinary field scale.

Treatment of infested plants being quite out of the question, control should aim at maintaining such plants in as healthy a condition as possible, at reducing the nematode population in infested land and keeping uninfested country free from this serious pest. Thorough cultivation and heavy manuring frequently enable infested plants to produce quite a satisfactory crop, particularly if it is a rapidly maturing one, such as tobacco. However, plants that have been infested in the seed-bed do not generally respond to such treatment, and such seedlings are better discarded and destroyed, transplanting being restricted to plants showing no outward sign of infestation. Seed-beds in districts known to be infested are best established, when practicable, on new ground, and a further seed-bed precaution sometimes adopted in infested areas is the steam sterilization of the soil prior to the sowing of the seed. When an infested crop has been harvested the uprooted crop residues should be destroyed by burning where such a procedure can be adopted, for by doing so the nematode population available for the infestation of the succeeding crop should be appreciably reduced.

A further reduction may be achieved by rotating immune crops with susceptible crops, but the farmer must remember that infestation will inevitably recur, eradication being an impossibility. In cases where susceptible land is free from infestation every effort should be made to keep it so, and, if possible, any seedlings required for planting thereon should be grown on the property. If they have to be obtained elsewhere they should be carefully examined for the presence of the eelworms, and if infestation is present it is wiser not to use such seedlings on clean properties. Nematodes do not travel far in the soil, moving only a few feet each year, hence their rapid dissemination to and in new areas is due to their being transported on implements, on the feet of workers and stock, in running water, and, of course, in seedlings, seed potatoes, or nursery stock. These modes of dissemination should be kept in mind when an effort is being made to maintain a clean property free from infestation.

SHEEP-DRENCHING AIDS.

If you don't want your fingers chewed when dosing the sheep here is a simple preventive. Get a piece of No. 8 wire and bend it into the form of a hairpin 9 inches long and 1½ inches wide at the bow end. With the sheep held by your knees insert the bow between the sheep's lips, and bring it down over the tongue behind the front teeth. Then with the right hand lift its upper jaw, and the man with the squirt, or the capsule, will have no difficulty in placing the dose well behind the root of the tongue.

The Bronze Orange Bug.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THE bronze orange bug, *Rhœcocoris sulciventris* Stål, was recorded as a Queensland insect in 1868, and for almost fifty years it has been known as a pest of citrus in this State. Formerly the insect was named *Oncoscelis sulciventris,* and a good deal of what has been written regarding the pest is to be found under that name.

The vernacular name, bronze orange bug, is almost universally used in those Queensland citrus districts where the pest occurs. In some publications the name orange tree bug is used, but this is unsuitable, as it fails to distinguish the species from several others found on the same host.

Distribution.

The distribution of the insect is obviously controlled largely by climatic influences. The species is found in northern New South Wales, and extends into Queensland as far as the Gympie district, but north of Gympie tropical conditions become more marked and the insect does not occur there. In the same way more than about 60 miles from the coast the bug quickly becomes rare and is heard of as a pest only in cooler parts, such as on the Great Dividing Range, particularly in the vicinity of Toowoomba. Even within the small section of south-eastern Queensland just outlined the bug is a major pest only in places of comparatively low average temperatures, notably on the Blackall Range and at Tamborine Mountain.

The bug is easily transported in the second nymphal stage. It is a common practice for pineapple growers to pack their fruit in grasses such as Red Natal and Blady taken from under or near citrus trees, and quite frequently second stage nymphs are found crawling amongst this grass, and no doubt many are transported about the State in this way. However, the climatic barrier appears to be insuperable, and there is no reason to fear any extension of the area of distribution of the pest.

Economic Importance.

Within the area in which it occurs the insect is responsible for heavy damage to individual orchards in every part, but in only two large districts, the Blackall Range from Montville to Mapleton and Tamborine Mountain, is it a major pest of every orchard. It is a general pest of lesser importance in the vicinity of Palmwoods and Nambour, and to a lesser extent in the Redland Bay district. The bug is essentially a pest of vigorous trees, and in the two districts mentioned as being most troubled by it only orchards in poor condition escape severe depredation unless control measures be adopted.

It is difficult to assess the damage attributed to the pest, as the indirect loss of fruit cannot be calculated with any degree of accuracy. The ill-effects may be described as cumulative, for not only is young fruit removed but the wood which is to bear the following crop is reduced or even eliminated. Further, after a few years of heavy infestation the trees produce little growth and become harsh and incapable of carrying a crop. From a comparison of the yield of infested trees with what might reasonably be expected, it is considered that 20 per

cent. loss is about the average for badly infested orchards, and 30 per cent. loss by no means uncommon. Habitually infested orchards soon become uncommercial.

Host Plants and Varietal Preference.

The bronze orange bug is found on all varieties of citrus grown commercially in the districts concerned. Oranges appear to be preferred to lemons, or mandarins with the possible exception of the Fewtrell Early variety. However, the presence of young soft growth is all that is necessary to make any variety acceptable to the pest.

In addition to cultivated varieties the bug feeds and breeds on *Citrus australis,* the native orange, or wild lime as it is sometimes called. However, the numbers to be found on the indigenous host are very small. A few score individuals on this tree constitutes a large population, whilst 2,000 bugs on one orchard tree is common, and on many occasions more than 5,000 individuals have been taken from one orange tree. Further, *Citrus australis,* though not uncommon, does not occur in very large numbers. Migration certainly does take place from the native host to orchard trees, but the number of bugs so arriving in the orchard is certainly insignificant compared with the number bred in the orchard. It has been noticed repeatedly that after a determined clean-up on the part of a section of orchardists it is several years before the bugs again assume major pest proportions in the immediate vicinity. This would not be expected if migration were a major factor.

Adults, eggs, and first and second stage nymphs are sometimes observed on other plants growing in close proximity to citrus trees, but all the evidence shows that none of these other plants serve as hosts on which the insect can feed.

Description.

The bronze orange bug, in common with other members of the group of insects to which it belongs, namely the Heteroptera, has a life cycle consisting of seven stages—the egg, five nymphal instars, and the adult. Growth takes place by a series of moults, the old skin being cast off and its place taken by a new one, often differing considerably in colour and other characteristics.

The Egg.

The eggs (Plate 108, fig. 1) are laid on the leaves as a general rule; but occasionally batches may be found on fruits or, as has been mentioned, on other nearby plants. Both surfaces of the leaves are used as oviposition sites. The eggs are laid in batches of fourteen in a characteristic formation. Each batch is laid in four lines, the two outside rows having three eggs each and the two inside ones four each. Occasionally incomplete batches are found, but these are due no doubt to the female having been disturbed during oviposition. So far as has been observed no more than fourteen eggs are ever placed in one batch. The eggs are fixed to the surface by a fluid which covers them when they are laid. Commonly the egg shells remain attached to the leaf for many weeks, or even months, after hatching has taken place.

The eggs are spherical in shape, shiny and light green to almost yellow in colour. They are relatively large, being little less than one-eighth of an inch in diameter. Several batches may be found on one leaf.

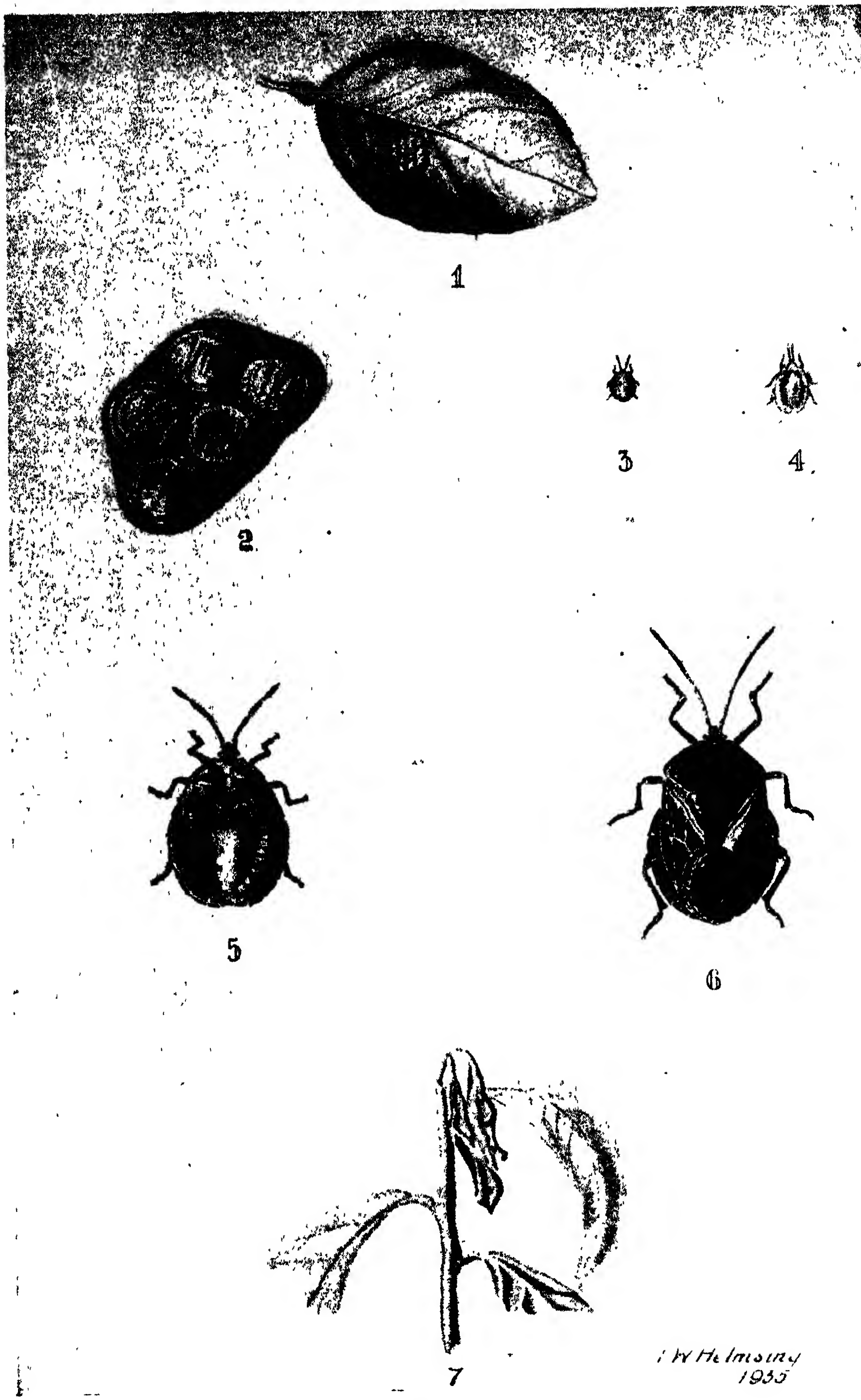

PLATE 108.

THE BRONZE ORANGE BUG (*Rhœcocoris sulciventris* Stål.).

Fig. 1. Egg cluster, half natural size.
Fig. 2. Eggs about to hatch (×4).
Fig. 3. First instar, natural size.
Fig. 4. Second instar, natural size.
Fig. 5. Fifth instar, natural size.
Fig. 6. Adult, natural size.
Fig. 7. Young citrus twig damaged by bug, half natural size.

Nymphal Instars.

Insofar as orchardists are concerned the nymphal stages of the pest may be divided conveniently into two groups. Group 1 consists of those stages which can be efficiently controlled by spraying, but against which no mechanical method known can be made satisfactory. There are two stages in this group—namely, the first and second instars. The bugs of this group are small, comparatively inactive, and do not feed but spend the whole of their time sheltering amongst the foliage until conditions of weather and tree growth induce further development. In the earliest stage (Plate 108, fig. 3) they are about three-sixteenths of an inch long, roughly oval in outline, and though capable of quick movement remain for the most part in groups generally close to the site at which they were hatched. They are rather fat-looking, slightly convex when viewed from above, and are glossy green in colour.

On moulting to the second instar (Plate 108, fig. 4) the bugs measure up to one-quarter of an inch in length and are still roughly oval in outline. Now, however, they are flat and very thin, and this stage is commonly referred to as the "tissue paper" stage, a name which aptly describes the general appearance. The colour may be light green, yellow or greyish, the latter colour predominating towards the end of winter. In this stage the insects are most difficult to find on the leaves where they lie closely apposed to the lower surface. Soon after moulting to the second stage the insects scatter to a greater or lesser degree. Mostly three or four remain on a leaf, but thirty are not uncommon, and as many as seventy have been noted.

Group 2 contains those bugs which are not efficiently controlled by spraying, but which, owing to the ease with which they can be dislodged from the tree, may be combated with some success by mechanical means. This group consists of the third, fourth, and fifth instars. These are larger in size, feed voraciously on outside twigs, and are in consequence more congregated than previously.

In the third stage the bugs are approximately three-eighths of an inch long, and by the time the fifth stage (Plate 108, fig. 5) is reached the length may be as much as seven-eighths of an inch. They remain roughly oval in outline, and the most conspicuous character is the colour. At first they are shining green, but this disappears and lighter green, orange, and brilliant pink forms are seen. They are now readily observed and their presence is made obvious by the malodorous secretion which they emit on the slightest provocation.

The Adult.

The adult bronze orange bugs (Plate 108, fig. 6) are robust insects measuring an inch in length and five-eighths of an inch across the greatest width of the abdomen. When first moulted from the fifth instar they are light bronze above and reddish-brown beneath. As they grow older the colour darkens and finally is black above and dark brown beneath. The legs are reddish-brown becoming lighter and almost red at the extremities. The head is small and the eyes lighter brown than the surrounding parts and rather conspicuous. The antennæ or feelers are reddish-brown at the base, but the second last and the last joints are orange-coloured. If the wings be pulled aside the upper surface of the abdomen is seen to be orange or reddish towards the centre and dark

brown to black at the margins. The adults can fly strongly, and though they remain quiet most of the day it is not uncommon to see them flying about from tree to tree.

Allied Insects.

There is no likelihood of the bronze orange bug being confused with any other species found on citrus in this State. A very similar bug, *Stilida indecora* Stål, has been recorded from citrus in New South Wales, but this species has not been found on citrus in Queensland. All the other species which attack citrus in Queensland are smaller than the bronze orange bug, and furthermore they are green in colour when adult.

Life History and Habits.

The bronze orange bug has but one complete life cycle each year. Eggs are laid in February and March, and even as late as April in some years. These hatch fairly quickly, the minimum time recorded being eight days. The young on hatching remain for the most part congregated until the time of the first moult, which usually takes place in five or six days after hatching. The second stage bugs then scatter more or less and take up positions on the under surfaces of the leaves in protected places. The bugs remain in this position for almost seven months, and during the whole of this time they do not feed. Nymphs of this stage have been kept alive in containers without food or even moisture for several months. High temperatures appear to be the only factor adversely affecting the insect in this stage, and on warm days it has frequently been observed that half an hour of direct sunlight proves fatal to the great majority. In this stage the insect clings very tightly to the leaves and cannot be dislodged by even very strong jarring of the limbs.

Thus the winter is passed in a quiescent state, and though thousands may be present on a tree it suffers no ill-effect. Even the closest examination at this time may fail to give any idea of the degree of infestation, and it is useless orchardists making examinations at this time to decide whether or not spraying is necessary.

With the return of warm conditions the tree begins to make growth and the bugs become active. Feeding is commenced and the third instar nymphs begin to appear in numbers early in September. The bugs are now more conspicuous as they become brightly coloured and larger and move to the outside twig growth to feed. Even before they are observed their presence is obvious on account of the foul smell associated with them from this time onwards.

Each of the last three instars occupy about three weeks or a little longer, and thus the adult stage may be reached in November. Adults are, however, as a rule not numerous until early in December. December and January are passed in feeding and mating, and eggs are again deposited in February as described earlier. No data has been obtained as to the number of eggs each female may lay, as it is rather difficult to keep the adults alive in capativity, and in all cases in which this was attempted death was obviously premature. It is, however, certain that each female can lay several batches, each consisting of fourteen eggs.

For the most part the bugs feed on the tenderest twig growth available, and the insect is thus essentially a pest of vigorous trees. To a certain extent very tender fruit, and the stalks of fruit, leaves, and flowers are also chosen as feeding sites. Attacked fruit, leaves,

and flowers are quickly shed and young twigs wither and die back, generally to the limit of hardened growth. Heavily attacked trees occasionally have practically the whole of the young fruit removed and, in addition, the wood which should carry the following crop also weakened or destroyed. Trees which carry many bugs for several successive years lose vigour and ultimately make little new growth. Furthermore, what growth is produced is usually short and incapable of carrying even a fair crop.

The bugs prefer the cooler side of the tree and the higher branches, and thus it is in these positions that the greatest amount of injury is usually noted.

When dislodged from the tree the nymphs, particularly the older stage ones, immediately turn and crawl towards the base of the tree. If undeterred they reach the base quickly and return up the trunk to the extremities of the branches.

The secretion is an almost colourless volatile liquid which the bugs can squirt a distance of as much as 2 feet. It is very corrosive and causes severe burning when it lodges on tender parts, temporary blindness often resulting when the fluid strikes the eye. The fifth stage nymphs and adults are quite aggressive in discharging this secretion. On the approach of a person they often manoeuvre their bodies so that they can eject the maximum amount of fluid in the direction of the intruder. They do not wait to be touched, but will discharge at a person merely passing within a foot or two of the twig on which they happen to be.

Control.

The all-important subject of control will be discussed under two headings—namely, control by the incidence of natural enemies and by artificial means.

A. Natural Enemies.

Though a number of insects prey on the pest the degree of natural control exercised by these in the orchard is very small and of little or no material value. Egg parasites are rare and predatory bugs, chiefly Asopidæ, are also uncommon, by far the greatest degree of natural control being exercised by insectivorous birds. Several species of birds are concerned, and where they are allowed to work unmolested they frequently do excellent work. Orchardists should protect these useful birds as far as they possibly can.

B. Artificial Control.

Artificial control can be accomplished either by mechanical means or by spraying. Of the two the spraying method is much to be preferred on commercial orchards, not only because it is so much more efficient as an actual control, but also because when correctly carried out the other effects of the spray are wholly beneficial, whereas the other effects of the best mechanical method are injurious to the tree.

Mechanical Means.

The mechanical method depends for its success on the fact that when in the last three nymphal instars the bugs can be dislodged readily from the trees. In this method the tree is jarred by the main limbs, each being tapped sharply with a padded mallet. The most satisfactory mallet is one of wood 12 to 18 inches long, so shaped that it can be

easily held in the hand and at the same time have most of the weight towards the head or striking end. The striking end should be wrapped in rubber or some such material to prevent excessive bruising or breaking of the bark. The limbs should be struck in rapid succession rather than heavily, as not only does this minimise the injury but is more effective in bringing the bugs to the ground. Prior to the banging the soil around the base of the trunk should be hilled up so as to form a smooth cone with sharply inclined sides. A strip of galvanised iron or other such material about 7 inches wide may be substituted for the cone. The strip is arranged so as to form a barrier around the trunk. On falling to the ground the bugs at once commence to crawl towards the trunk. Their progress is impeded by the barrier of earth or other material, and thus become congregated and can be dealt with easily. The destruction of the bugs may be carried out in any convenient way. Burning with blow lamps while they are still on the ground is the most usual method employed, but placing them in a container half filled with kerosene and water or other poisonous liquid is also practised. Burying cannot be recommended.

This method can be employed only when the bugs are in the third, fourth, or fifth instar. In practice it is not wise to wait much longer than is actually necessary, for the breeding is not quite even, and if the work is left until too late in the year a proportion of the bugs may have become adults and thus escape.

Tapping of the trees has little to commend it. It cannot be expected to give more than about 70 per cent. control, and quite frequently it gives considerably small percentages. Apart from the low efficiency, the operation, no matter how carefully carried out, always results in injury to the trees. Bruising and breaking of the bark favours the entrance of borers and diseases. Again, the tapping must be done at that period of the year when the bug has already done a certain amount of damage, and also at a time when the crop is just setting. The result is that in every case an appreciable amount of fruit is lost. It is impossible to carry out the work thoroughly without causing some of these ill effects.

Handpicking is sometimes employed, but it is very slow unpleasant work and is far from efficient except on very small trees. Unfortunately it is not work that can be given to children, as the bug secretion is too severe on tender skin and the eyes.

Mechanical methods then are to be recommended only when special circumstances render the use of the spray impracticable or not economical. This should vary rarely, if ever, happen on a commercial orchard. The only value mechanical methods have in ordinary circumstances is for use on single garden trees, and even with these it would generally be found better to use the spray.

Spraying Method.

The formula of the spray for use against the bronze orange bug is as follows:—10 lb. resin, 3 lb. caustic soda of good commercial quality, 1½ lb. fish oil, preferably herring oil, and 40 gallons water. It is essential that the spray be correctly prepared, and attention should be given to the details which follow. Grind up the resin as finely as practicable and then either mix the resin and caustic soda while dry and add the mixture to 2 gallons of water, or dissolve the caustic soda in 2 gallons of water and add the resin slowly while the solution boils

gently. The latter method is generally used, and appears on the whole to be the more satisfactory. The solution expands appreciably when hot, and the container in which it is boiled should therefore be considerably larger in capacity than the volume of the water, otherwise boiling over may occur. The solution should be kept fairly well stirred whilst being boiled to prevent any solids from sticking to the bottom. A light brown or creamy scum appears on the cooling surface of the mixture, the boiling of which should be continued until a clear dark liquid can be detected beneath the scum. The fish oil is then added and the whole boiled for a few minutes to ensure that no free oil remains. The concentrate thus prepared is then ready for dilution with 38 gallons of cold water. The agitator should be kept running whilst the spray is in the vat. When the concentrate cools a good deal of solid is precipitated, and thus when large lots are prepared it is necessary to divide the stock solution while hot. This may be done by dividing up as soon as prepared, and as most spray vats in use in Queensland have a capacity of either 40 or 75 gallons, the stock solution will be most conveniently divided into lots of 2 or 3¾ gallons. If the concentrate is to be stored the fish oil should not be added before storage unless the mixture can be kept in perfectly airtight containers. If preferred, however, a concentrate can be prepared as described up to but not including the addition of the fish oil. This concentrate can be stored in bulk until required when it is reheated, the fish oil added and the mixture again boiled for a few minutes. This final concentrate can then be diluted to spray strength.

The results obtained against the bug will depend absolutely on the thoroughness of application. To effect a kill the bugs must be hit at the time of spraying, as the spray is purely a contact one and dries quickly. The best results will be obtained by spraying the outside of the tree first. Whenever the bugs are molested they immediately commence to crawl down the branches. Thus by spraying the outside first those bugs which are merely disturbed will crawl at once into positions in which they are more easily hit from the inside. This method of spraying is, of course, the reverse of what is usually recommended, and is only practicable on fairly large trees where the operator can stand well inside the tree and avoid the heaviest drip.

It may be pointed out that the great majority of bugs, even though dead, do not fall from the tree for some considerable time, and, therefore, it is not possible to obtain any idea of the amount of good done merely by inspecting the ground under the trees immediately after the spraying. A careful examination of the tree an hour later will, however, generally give a good indication of the "kill."

Though the spray is somewhat effective against all active stages of the pest, by far the best results are to be obtained against those in the second instar. As will be seen from the life history notes this stage is to be found from the early part of March at least until August. Spraying, therefore, should always be done during the period intervening between those months. It does not matter greatly just when the application is made within that period, but it is wise to do it as early in the year as is convenient, preferably late in March or early in April. If left too late it may hamper other work, and at the same time the maximum beneficial effects of the spray may not be secured. The spray, in addition to its effect on the bug, is a very efficient scalicide, and further has a marked cleansing effect on the skin of the fruit.

Though the spray is sticky it disappears quickly from the fruit, and there will be no necessity to wash off any residue if the fruit be left on the tree for three or four days after application.

The only ill-effect noted after extensive use of this spray mixture by orchardists has been when it was used in very hot weather or when the preparation of the spray was faulty. In regard to the former the weather is never very hot during the period recommended for application against the bug, and no ill-effects have been noted when the temperature did not exceed 90 degrees F. With respect to the preparation, this is simple enough, and the few mistakes made have been through the use of shortcut methods in futile attempts to save a little time.

QUEENSLAND SHOW DATES, 1935.

March.

Allora, 6 and 7.
Milmerran, 12.
Goombungee, 15.
Pittsworth, 20 and 21.
Warwick, 26 to 28.

April.

Toowoomba, 1 to 4.
Tara—Show 3, Campdraft 4.
Dalby, 10 and 11.
Crow's Nest, 10 and 11.
Oakey, 13.
Kingaroy, 11 and 12.
Chinchilla, 16 and 17.
Nanango, 16 and 17.
Miles, 24.
Sydney, 15 to 24 April.
Dirranbandi, 24 and 25.
Rosewood Campdraft, 27.
Taroom Campdraft, 29.

May.

Wallumbilla, 1 and 2.
Taroom, 1 and 2.
Beaudesert, 1 and 2; Campdraft, 3 and 4.
Wondai, 2 and 3.
Goondiwindi, 3 and 4.
Longreach, 6 to 9.
Murgon, 9 to 11.
Blackall, 13 to 15.
Mitchell, 15 and 16.
Mundubbera, 15 and 16.
Goomeri, 15 and 16.
Barcaldine, 21 and 22.
Ipswich, 21 to 24.
Gympie, 22 and 23.
Biggenden, 23 and 24.
Toogoolawah, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.

June.

Marburg, 1 to 3.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Boonah, 12 and 13.
Esk, 14 and 15.
Warrilview, 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Gatton, 3 and 4.
Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Cairns, 23, 24, 25.
Atherton, 30 and 31.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.

September

Imbil, 6 and 7.
Tully, 13 and 14.
Innisfail, 20 and 21.
Rocklea, 21.
Kenilworth, 28th.

Diseases of the Banana.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

BUNCHY TOP.

BUNCHY top differs considerably from the usual conception of a plant disease. It is not caused by a fungus or bacterial parasite, but by an infectious agent or virus which is very much smaller than either of these. Although this virus cannot be seen by even a high-powered microscope, it is known to live and multiply in the sap of the diseased plant. In most virus diseases the affected plant has no definite lesion such as a spot or rot, but is usually stunted and abnormal in foliage or fruit development.

In the case of bunchy top the leaves formed after infection are short and narrow with the margin distinctly up-curved. They fail to bend over normally and retain a stiff erect habit which, combined with the fact that the leaf stalk is greatly reduced in length, gives the characteristic rosetted appearance to which the disease owes its name. The foliage on such plants is crisp and brittle when crushed. A bunch is rarely produced unless infection has taken place late in the life of the plant.

Effective control of bunchy top necessitates recognising the disease in its early stages. A plant should be regarded with suspicion if the youngest leaves exhibit a light green colour along the edge and have blades which dip back sharply from the midrib and curve in again conspicuously from the margin (Plate 110). A definite and unquestionable diagnosis can then be made by examining the base of the youngest leaf from the underside and with the light behind it. If the plant is infected there will be seen narrow dark-green lines, broken in a dot and dash manner or sometimes continuous, lying between and parallel to the clear veins which run out at right angles to the midrib (Plate 109). There is also often one or more wide dark-green streaks running down the outside of the leaf stalk near its junction with the pseudostem.

Bunchy top is spread in the plantation by the banana aphis when it sucks the virus-infected sap of a diseased plant and then leaves it and feeds on a healthy one. Aphids may travel considerable distances in the air, and this accounts for isolated outbreaks of bunchy top in plantations otherwise free from the disease.

In a single stool the virus from a diseased parent plant may travel in the sap stream down to the corm and thence out through the connecting tissue to the young suckers, which will in turn develop the disease, usually remaining in a stunted and rosetted condition. The possibility of sucker infection has an important bearing on the control measures discussed below.

Control.

There is no known method of destroying the virus in the plant without destroying the plant itself, and hence anything in the nature of a cure is impossible; nor is it commercially practical to destroy all aphids in a plantation and so limit the spread of the disease by this means. It, therefore, becomes necessary to concentrate on eliminating the source of supply of the virus by exclusion and destruction of diseased plants.

Firstly, care must be taken that all suckers used for planting are free from bunchy top infection. The agents of the Banana Industry Protection Board are in a position to advise growers where suitable planting material may be obtained. They should also be consulted regarding the current planting policy, as a planting permit may have to be refused if the spread of bunchy top or other disease or pest is involved.

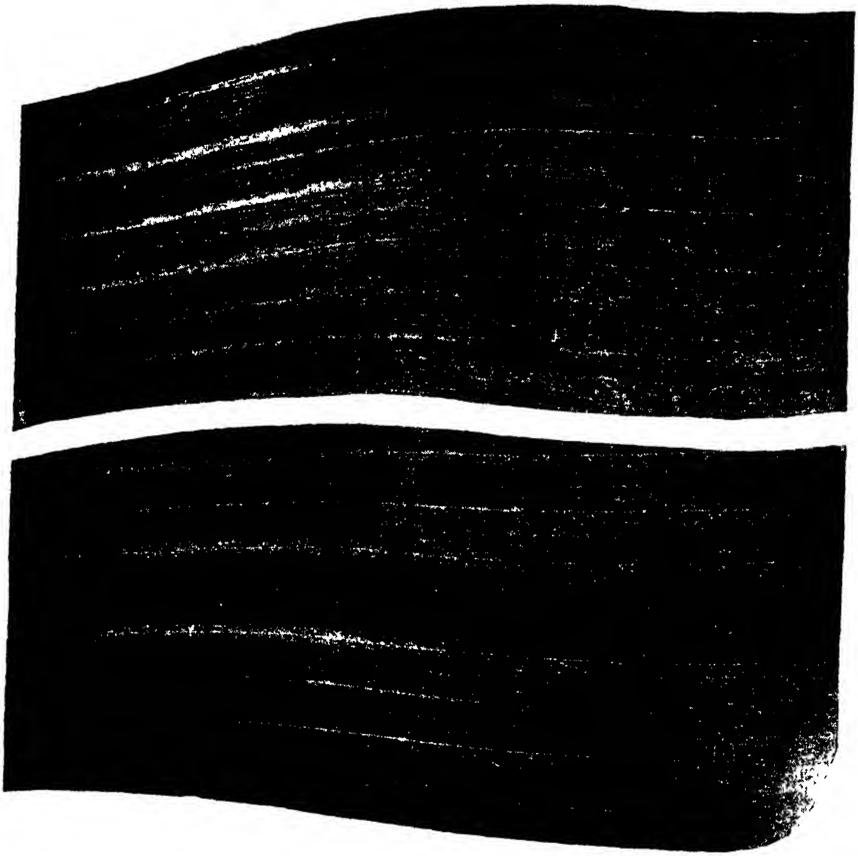

PLATE 109.—BUNCHY TOP.

Portions of banana leaves photographed from the underside by both transmitted and reflected light. Above: Leaf from bunchy top infected plant showing the characteristic dark dots, dashes, and lines. Below: Leaf from a healthy plant for comparison.

Secondly, diseased plants must be destroyed as soon as they show the first symptoms of infection. Thorough inspections should be made for the purpose of locating bunchy top plants. The frequency of these inspections will depend on the amount of bunchy top present, and must ensure that in every case the diseased plant is found as soon as the infection becomes recognisable. Eradication must follow immediately, and to be effective the following procedure should be followed:—

To prevent aphids leaving the diseased plant for a healthy one first pour not less than half a pint of pure kerosene into the central

leaf of the affected plant and other plants connected with it in the same stool. Wait for a few hours to allow the kerosene to trickle down round the leaf bases and so kill all aphids present. Then dig out the stool, including the infected plant and any others connected with it, and chop into small pieces to facilitate drying.

Heart Rot.

A second virus disease of bananas is now known to occur in this State. Although this disease is widely distributed throughout Southern Queensland it fortunately has not exhibited the capacity for rapid spread that has made bunchy top so serious. The characteristics of the disease vary at different times of the year. The most general symptom is a chlorotic condition of the younger leaves formed by light green to yellow streaks or bands which extend out from the midrib. These streaks may be narrow and interrupted so that a mosaic effect is produced (Plate 111). During the colder months a soft black rot may involve the funnel leaf and develop down into the heart of the plant. If this rot reaches the corm the whole plant may die. Often, however, with a change in environmental conditions the extension of the rot will cease, but the new leaves coming away may be narrow with irregular and blackened edges resulting from the previous rotting of their margin. As in the case of bunchy top the virus may pass from a diseased plant to the suckers with the production of a stunted and heavily mosaic-marked plant.

The cause of heart rot was first investigated by Magee in New South Wales. He showed that the disease was due to an infectious virus which was carried from infected to healthy plants by the banana aphis. Heart rot therefore resembles bunchy top in this respect. As would be expected, the control measures advocated in the case of the latter have so far effectively checked the spread of the former disease. Briefly, the recommendations are as follows:—

1. Plant only disease free suckers.

2. Kerosene and dig out an affected stool immediately heart rot symptoms are noticed.

Leaf Spot and Speckle.

Although leaf spot and speckle are probably distinct diseases they will be considered together here since they are usually both present in the plantation, and the final effect on the plant is very similar in each case.

Leaf spot is caused by the fungus *Cercospora musæ*. It is a disease which is widely distributed outside Queensland occurring as it does in India, the Eastern Tropics, and Fiji. The spots are easily recognised and are most prominent on the upper surface. They consist of narrow, oblong, or elliptical, brown to black, areas about half an inch long by an eighth in width. With age the centre dries out leaving a characteristic grey spot bordered with a black line and surrounded by a yellow halo. Usually the grey spots are still easily distinguishable after the leaf has dried out (Plate 112). Minute greyish tufts of fungus spores can sometimes be seen on the surface of the spots following prolonged rainy weather.

Speckle is found on the under surface of the leaf as scattered or aggregated dark brown to black blotches of varying size and intensity. These dark patches are formed in the first place by a close speckling

PLATE 110.—BUNCHY TOP.

Two banana plants showing the symptoms of a fairly recent infection with bunchy top. In the younger leaves notice the dipping back of the blades from the midrib and the incurved and waved condition of the margin.

PLATE 111.—HEART ROT.

Portion of a leaf showing the characteristic mosaic banding.

of the surface with greyish dots which later darken and coalesce (Plate 113). The cause of speckle is not as yet definitely known, although it is evidently of fungus origin. Its distribution is as wide as leaf spot.

Leaf spot is usually most abundant towards the outer end of the leaf, whilst speckle is, if anything, more prevalent towards the base. A shaded situation may definitely favour the development of the latter, but not the former. With both diseases the lower leaves are attacked first, and if the spots are numerous the individual lesions will coalesce and form large peninsulas of dead tissue extending from the margin in towards the midrib. Eventually the whole leaf will dry out. This results in a gradual defoliation of the plant from the base up and under average plantation conditions on growing plants an equilibrium is reached at which there are usually three leaves unaffected and four to five with leaf spot and speckle present in increasing intensity from above downwards. This is apparently sufficient leaf area to support the growth of the plant, and it is doubtful whether the initial size of the bunch when thrown is greatly affected by these leaf diseases. However, once the bunch is out no further leaves are formed, and the gradual invasion and consequent death of those present deprives the bunch of its normal shelter, with the result that the fruit often fails to develop properly and may become badly scalded.

Leaf spot and speckle are usually present at all times of the year, the relative importance of each varying somewhat with environmental conditions. Both diseases are favoured by wet weather, but in the case of leaf spot three or more days of continuous rain during the moderately warm weather of February, March, or April appears necessary for an epidemic outbreak. The leaf defoliation is most serious during the winter months when growth is at its slowest. In the Spring the situation changes and the plants tend to outgrow the disease. Conditions such as poor drainage, unsuitable soil and aspect, cold and heavy weevil borer infestation will add to the seriousness of leaf disease by retarding the growth of the plant, and even on their own account in the absence of disease may be responsible for abnormal leaf fall.

Control.

From the above discussion it will be seen that the maintenance of a continuous vigorous growth will help towards reducing loss from these diseases. In this connection it must be remembered that the banana is essentially a tropical plant and greatly affected by cool temperatures. The broad flexible leaves and other growth characters indicate that adequate shelter from strong winds and abundant and evenly distributed moisture are necessary. The roots are adapted to a loose well-drained soil adequately supplied with humus, and will suffer if exposed to extreme variations of wet and dry conditions. The provision of adequate windbreaks and the safeguarding of the better surface soil from erosion during the heavy summer rains by means of terracing, cover-cropping and other modifications of the usual cultural practice will greatly assist in maintaining the productiveness of a banana plantation in spite of the presence of disease.

Direct control of the leaf diseases by fungicides is made difficult by the nature of the banana plant itself and the inaccessibility of most plantations. Dusting has been proved to be ineffective, probably owing

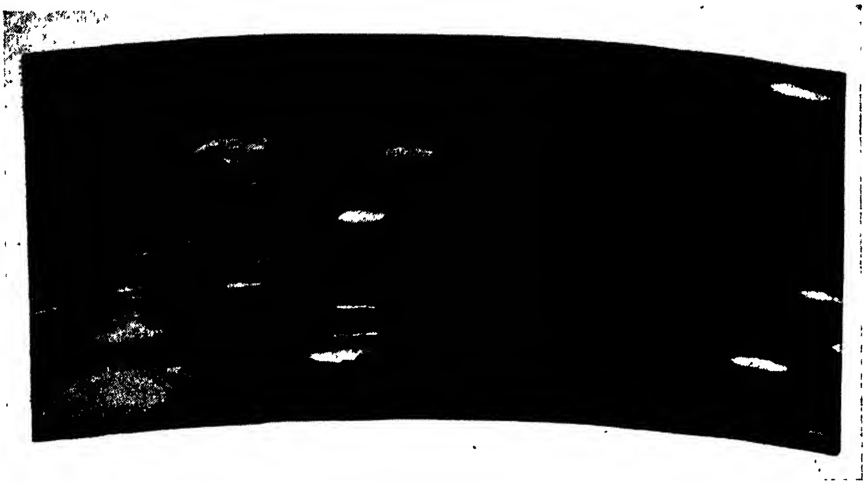

PLATE 112.—LEAF SPOT (*Cercospora musæ*).

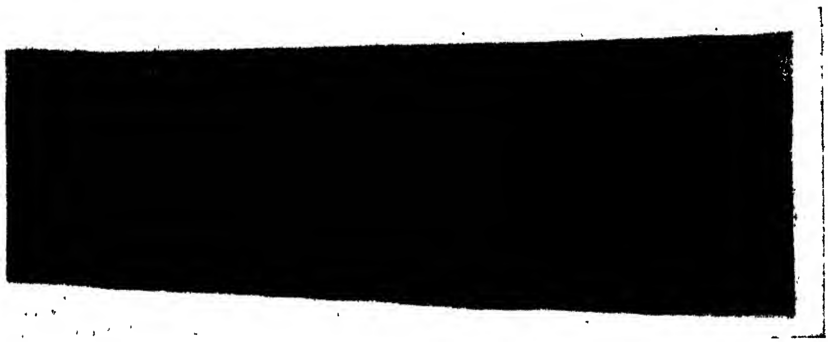

PLATE 113.—LEAF SPECKLE.

PLATE 114.—YELLOW LEAF SPOT.

Four Cercospora spots are included in the specimen, and form a comparison as regards size. (Slightly reduced.)

to the difficulty of obtaining a permanent cover on the shiny leaf. Bordeaux mixture applied in February and March with a suitable spreader will check speckle and to a lesser extent leaf spot, but it is doubtful whether the final results obtained justify the trouble of spraying such a crop as the banana.

Perhaps the most practical method of reducing the loss due to leaf defoliation is to protect the developing bunch from exposure by covering it with bagging. Two methods are available. The bunch may be entirely enclosed in a hessian bag of suitable size. This procedure results in the greatest final benefit, but the slowness of the operation and the difficulty of determining the correct cutting maturity are decided disadvantages. In the second method half a corn sack is used. This is rapidly thrown over the exposed side of the bunch and secured behind with a nail. All bunches likely to be exposed should be covered as soon as the fruit commences to fill out, the correct time being largely a matter of experience. In order to provide for the heavy defoliation in winter and spring bagging should commence in April and continue throughout the winter so long as bunches are left without leaf protection.

Yellow Leaf Spot.

This leaf spot is serious only in the northern parts of the State, where it may cause leaf defoliation in a manner similar to Cercospora leaf spot. The disease commences on the lower leaves as indefinite light yellow areas. These take up an elliptic or more characteristically a definite diamond shape, turn deep yellow, and then gradually darken in the centre where they dry out to dark brown, leaving a narrow but distinct yellow margin (Plate 114). These spots, except in the very earliest stages, are considerably larger than those caused by *Cercospora musæ*, and may be as much as 3 to 4 inches long by 1 to 1½ inches broad. Young plantations may suffer badly from yellow leaf spot, whereas they are usually free from severe attacks of the other leaf diseases.

Yellow leaf spot is apparently caused by the fungus *Cordana musæ*, whose fructifications form a greyish down covering the under surface of the spots. This organism is widely distributed throughout tropical countries, but is not usually considered of as much importance as in Queensland, where severe defoliation has been known to result from its presence.

In plantations where yellow leaf spot is serious the protection of the fruit from scalding by the method described in the case of leaf spot and speckle should give some relief.

Panama Disease.

Panama disease affects only the tall-growing varieties, such as the Sugar, Lady's Finger, and Gros Michel. It is widely distributed throughout the world and has received its name from the region where it was first known to cause serious loss. The presence of the disease is indicated by the development of a deep yellow colour round the margin of the lower leaves, which later turn brown and dry out. The leaf stalk collapses, leaving the dead leaves in a gradually increasing number draped round the pseudostem.

A definite diagnosis of Panama is made by splitting up the base of the plant lengthwise, when the corm will be found discoloured by numerous brown to black lines running in all directions through the

white tissue. The brown vessels can usually be followed up through the sheathing leaf bases and out into the vertical partitions of the leaf stalk. The reddish brown lines in the latter situation are often a means of quickly identifying the disease.

Panama disease is caused by a fungus (*Fusarium cubense*) which is capable of living for some time in the soil and when a suitable opportunity offers may infect the banana plant by means of the roots or wounds in the corm. It then travels up the water conducting vessels causing the black lines already referred to. The fungus may grow out through the tissue connecting a diseased parent with the surrounding suckers, and the planting of such infected material is one of the chief means by which the disease is spread.

Control.

The only satisfactory way of dealing with Panama disease is by a combination of exclusion and eradication.

1. Only land which has not previously grown bananas or on which the disease has never occurred should be planted with susceptible varieties.

2. Obtain planting material only from a district in which Panama does not exist.

3. A plant may become infected by wind-borne spores, or by infectious material accidentally introduced on boots and farm implements. Immediately a plant shows signs of infection the whole stool should be dug out, chopped into pieces and burnt on the spot. Any instrument used in cutting a diseased plant should be washed in formalin solution or passed through a flame before using it on a healthy plant. It is unwise to replant in the same spot.

4. Unfavourable soil conditions, especially poor drainage, greatly increases the severity of Panama attack and, conversely, the provision of optimum conditions of growth for the fruit will help to diminish the loss from this disease.

Dry Rot.

Dry rot is not a disease of serious consequence, as only an isolated plant or a small group of plants is usually attacked. In an affected plant the leaves commence to die back from the margin and eventually the whole of the foliage becomes brown and dry. The pseudostem may be easily pushed over owing to the absence of sound roots. The normal corm tissue is largely replaced by a more or less dry, punky substance of a dirty white to brown colour. This consists of a mass of closely interwoven fungal threads which have invaded the corm and largely replaced the plant tissues.

Dry rot is caused by certain of the mushroom and bracket fungi, including a *Poria*, all of which live for the most part on dead and rotting stumps such as are present in abundance in the average banana plantation. From here it is possible for them to pass to a living banana plant should one be growing in close proximity and by invasion of the corm produce the dry rot described above.

In order to prevent the spread of dry rot to adjacent stools it is advisable to locate, if possible, the stump or roots from which infection has proceeded and remove and burn this material together with the infected corm.

Cigar End.

Cigar end is a trouble affecting relatively young fruit in the plantation. A firm dark decay commences at the apex of the fruit surrounding the dead floral parts. This rot extends back slowly for half an inch or so, causing the tissue to shrink and become more or less rounded in contrast to the angular nature of the immature fruit (Plate 116). There is a sharp line of demarcation between healthy and diseased tissue. Usually no further extension takes place, but the fruit ripens prematurely. The disease is caused by a fungus (*Stachylidium theobromæ*). The spores of this organism are produced in abundance on the surface of the blackened area, where they form an ashy grey or pinkish grey coat. In typical cases this gives to the shrunken end a striking resemblance to a burnt cigar tip, hence the name. The old shrivelled floral organs often persist for considerably longer than normally on affected fruit.

Although occasionally a large proportion of the fruit in a bunch is affected, it is more common for only a few fingers to show the disease; hence special control measures are not usually required. However, it is a wise precaution to open up the young bunch, where necessary, to the light and air and to remove the bracts which tend to remain attached to the developing hand, especially during wet weather. After a spell of dry weather when choke throat is in evidence, splitting the top of the pseudostem may be necessary to relieve the pressure on the outcoming bunch and so avoid injury to the tips of the fingers.

Black Finger.

While the bunch is still young and the fruit immature and angular one or more fingers may develop a jet black decay commencing at the tip and extending back towards the base until, unlike cigar end, the whole of the fruit is involved. The fruit becomes tapered by the gradual shrinkage of the affected region, which remains firm and eventually dries up to form a mummy (Plate 117). In the later stages numerous minute raised pustules constituting the fruiting bodies of the causal organism appear over the surface.

The cause of black finger has only recently been investigated. A fungus (*Phoma sp.*) has been isolated from affected fruit, and its pathogenicity proved by artificially inoculating healthy fruit on the plant and in the laboratory.

So far this disease has not appeared with sufficient frequency to call for special control measures, but the ventilating of the young bunch as for cigar end should help to prevent its occurrence.

Gumming.

Fruit which have developed gumming can be readily distinguished, as the bunch begins to fill out, by a tapered or pinched appearance of the flower end. One or more fruit so affected may be scattered through the bunch. On splitting the fruit lengthwise a reddish brown gummy condition of the tissues below the flower tip and extending along the centre will be apparent. Dark gummy specks of less intensity may form a more or less interrupted band along the outer margin of the pulp. Affected fruit does not ripen as soon as the normal, the tip in particular remaining green.


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PLATE 115.—BLACK PIT.

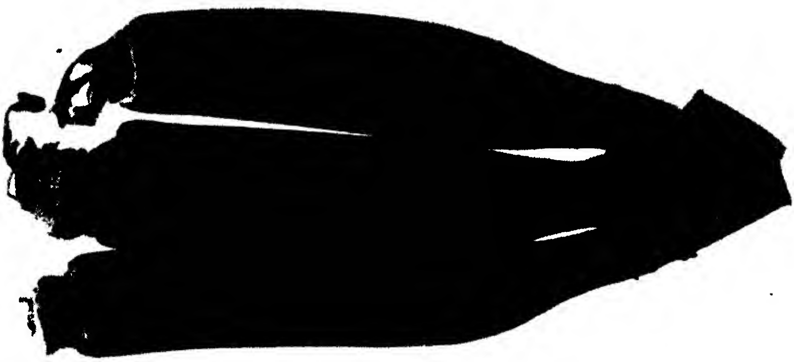


PLATE 116.—CIGAR END.

PLATE 117.—BLACK FINGER.

A disease occurring in the West Indies which closely resembles this one has been shown to be due to infection by a bacterium through the floral organs of the young fruit. As bacteria have in the past been isolated from Queensland specimens, it is possible that the same trouble exists in both countries.

So far it has not been necessary to take special precautions for the control of this disease, though the remarks already made regarding the opening up of the young bunch and the removal of bracts can be applied here also. All fruit having the characteristic pinched tip should, of course, be rejected when packing.

Black Pit.

Black pit has made its appearance on frequent occasions since it was first recorded in 1930. Commencing as small reddish spots, shallow black pits of $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter are formed in the skin of green fruit (Plate 115). The spotting is most abundant on the upper hands of the bunch and on mature fruit.

The lesions are restricted to the skin and do not usually act as centres for any further decay. However, when the pits are numerous the disfigurement is sufficiently serious to render the fruit unfit for market, and at times whole bunches have had to be discarded.

The cause of black pit is not definitely known, but it has been observed that bunches bagged in the manner advised in connection with leaf spot develop few or no spots. Accordingly this means of reducing loss is recommended in plantations subject to the disease.

Squirter.

Squirter is a disease rarely seen in Queensland, since it usually makes its appearance in cased bananas after arrival on the Southern markets.

A fruit typically affected with this disease has the pulp decomposed to a dark semi-fluid state so that a squeeze of the hand will expel it in a stream from the stalk end. At an earlier stage there will be found a dark area of rotting tissue lying along the centre of the fruit with or without an obvious connection with the finger stalk through which infection almost invariably occurs (Plate 118). External symptoms may take the form of a blackened stalk, but are often lacking altogether.

The disease is caused by a fungus (*Nigrospora sphærica*), which for the most part exists in a non-parasitic manner on leaf bases, the bunch spathe or other dead banana material in the plantation, and on discarded bunch stalks and rotting fruit in the dumps near the packing shed. The shiny black fungus spores produced in these situations are liberated into the air and contaminate the fruit either in the plantation or during packing operations. The fungus then gains entrance through the broken fruit stalk and travelling down the vascular fibres sets up the typical rot in the pulp of the fruit.

Squirter does not develop when the fruit is in the unsprung or in the fully ripe condition, but in the intermediate stages. About ten days are necessary for the complete rot to take place. The disease is seasonal in its occurrence and is met with only in the cooler months from May until late spring. Chilling may have some indirect bearing on squirter development, and the delayed ripening period in the winter months may also be a factor in its seasonal distribution.

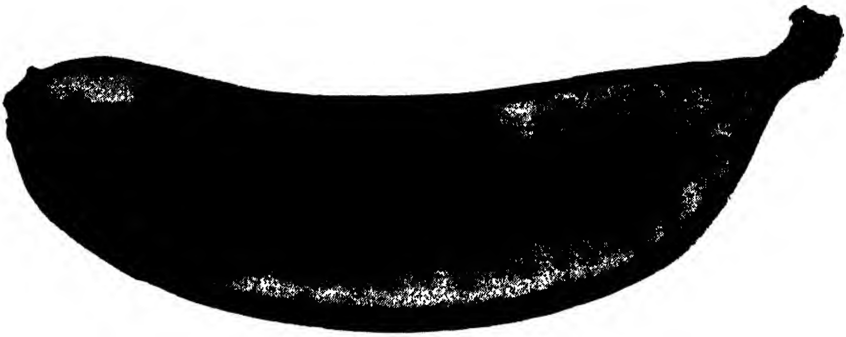


PLATE 118.—SQUIRTER.

PLATE 119.—BLACK END.

PLATE 120.—ANTHRACNOSE.

Control.

1. Plantation and packing-shed hygiene will help to reduce the number of spores present. The bunch spathe and loose trash should be removed from the vicinity of the bunch. Rejected fruit and bunch stalks should be buried or burnt and the packing shed sprayed out occasionally with a 5 per cent. solution of formalin.

2. During the winter months squirter-liable fruit should be marketed without delay and ripened as quickly as possible by up-to-date methods so that the period during which the rot can take place is reduced to a minimum.

3. Packing in part hands instead of singles will often reduce the number of fruit infected.

4. Bagging bunches during the winter months, as has been advocated for leaf spot control, may help with squirter also, as it will lessen the amount of chilling likely to take place.

Fruit Stalk Rot or Black End.

This is purely a transport and market trouble. As the fruit ripens a soft, black, and usually wet rot commences at the broken end of the fruit stalk, or, in the case of bunch fruit, in wounds caused by bending the fruit at its point of attachment to the main stem. This results in a black shrivelled condition of the fruit stalk, from whence the rot may extend to the adjacent skin of the fruit and produce a soft watery condition of the pulp beneath (Plate 119).

Various wound parasites, more especially *Glœosporium musarum, Nigrospora sphærica, Fusarium* spp., and *Stachylidium theobromæ* are associated with this type of decay. The development of *G. musarum* is favoured by high temperatures and most of the black end in summer is due to this organism. *N. sphærica* is active during the winter and supplements the work of *Glœosporium* at this time. The species of *Fusarium* and *S. theobromæ* are of comparatively minor importance and are apparently unrestricted as regards their time of appearance. All these fungi occur abundantly on banana refuse in and around the packing shed and on dead leaf stalks, bunch tracts, and other parts of the plant in the field. Consequently, contamination with the spores of these organisms is easily accounted for. Bruises caused by rough handling and the surfaces exposed by breaking the bunch into fingers then serve as points of entry for the fungus, which develops further during transport.

Control.

1. Practise packing shed and plantation hygiene as recommended for squirter control. The plants should be kept reasonably free from dead leaves by periodic trashing.

2. Cut, pack, and rail fruit with the minimum of delay.

3. During periods when black end is prevalent the consignments should be ripened immediately they arrive at the market by up-to-date methods, keeping the humidity as low as practicable during the process, and the temperature at the correct point.

4. Pack in part hands rather than singles, avoiding undue tearing when splitting up the hands.

5. In the case of fruit sold and ripened in the bunch practically all loss may be eliminated by careful handling of the fruit so as to avoid bruising the fruit stalk.

Anthracnose.

Like black end, anthracnose is mainly a marketing trouble. Dark slightly sunken areas appear on the skin of the ripening fruit and enlarge rapidly (Plate 120). At first the skin only is affected, but later a soft water-soaked condition extends into the pulp and greatly hastens what is commonly known as the overripe condition. Under moist conditions the surface of the spots becomes covered with a pinkish mass of the spores of *Glœosporium musarum*, the fungus causing the disease.

Anthracnose is of most importance during a period of two to three months in midsummer. The skin of the fruit marketed at this time appears to be of a softer nature and more susceptible to attack, and the high temperatures prevailing favour the growth of the parasite. At this time black depressed areas may be formed on green fruit in the plantation, but this is of rare occurrence.

No definite means of control are known. The recommendations made in connection with black end are applicable here also. Careful handling at all stages to avoid bruising is important. As there is a tendency for fruit to ripen quickly during the summer months when anthracnose is prevalent the correct picking maturity must be studied in order to avoid the waste associated with fruit arriving in a mixed ripe condition. Fruit should not be allowed to stand in the hot sun either before or after packing.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Inland Pastures.

PART I.

Mitchell Grasses in the Warrego District.

By W. D. FRANCIS, Assistant Government Botanist.

PART II.

Response during 1934 Season of Mitchell and Other Grasses in Western and Central Queensland.

Compiled by S. L. EVERIST, Assistant to Botanist, from reports received.

[A Report submitted to the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, on 14th April, 1934.]

Foreword.

By C. T. WHITE, Government Botanist.

DURING the year 1933 considerable attention was given to statements from various sources that the Mitchell grasses of Western Queensland were diminishing, due to prolonged droughts and continued stocking. Therefore, when the drought broke towards the end of 1933, it was decided to try and obtain some definite information on the response of the Mitchell grasses following the good rains experienced over most of Western and Central Queensland. It was thought expedient, too, to obtain information on other grasses and herbage plants at the same time.

In March, 1934, Dr. E. Hirschfeld, who has taken considerable interest in Queensland grasses and carried out some experiments with them on his property in the Inglewood district, Western Darling Downs, wrote to the Hon. F. W. Bulcock suggesting that I should visit Western Queensland for the purpose of making a general survey of the pastures and their response following on the bounteous season of spring and summer 1933-34. Owing to Departmental work on hand it was not expedient for me to carry out this work, but it was decided that the Assistant Botanist, Mr. W. D. Francis, should visit the Charleville area for the purpose of obtaining information from station owners and others as to the regrowth made by Mitchell grasses. A careful study was made by Mr. Francis of Mitchell grasses in the field, and the report embodying his observations and recommendations is published herewith as the first part of the general report on the inland pastures. The possibility of going on with the experiments outlined by Mr. Francis will be considered in the near future.

On the 6th March, 1934, a circular letter was sent by the Department of Agriculture and Stock to all District Stock Inspectors and Stock Inspectors in the Western and Central districts. The assistance of the Land Administration Board was enlisted and the same circular was sent to Land Commissioners and Land Rangers in the Western and Central districts.

In the circular the following questions were asked:—

1. How have the Mitchell grasses in your district responded during the present season?
2. Is there more than one kind of Mitchell and more than one kind of Flinders Grass growing in your district? If so, could you let us have specimens with notes on the relative value of each?
3. Are there any other grasses of outstanding value growing in your district and valuable on account of either palatability or drought resistance?
4. Are there any herbs of outstanding merit associated with the grasses?
5. This Department has co-operated with many graziers in Central and Western Queensland by naming and reporting on any grasses and herbage plants submitted. We would be pleased to receive any specimens you care to send. In sending more than one specimen, number each and retain a duplicate similarly numbered. Of grasses a whole stalk doubled up so as to fold comfortably in a piece of newspaper should be sent, as well as several seed-heads. Of herbs, trees, &c., a shoot a few inches long bearing flowers or seed-heads should be forwarded.

The response to this circular was very gratifying and for months reports and specimens poured into the Department.

The specimens were determined as quickly as possible and the reports were filed until all had been received.

These reports have now been examined carefully and a summary of them is given below. The report is in two sections. The first deals with the reports from the various districts. In this portion will be found notes on the response of the Mitchell and Flinders grasses, and remarks made by various officers upon other grasses and herbage of the areas reported on by them. The second section consists of a list of the more important species of grasses and fodder plants forwarded with notes on the distribution and fodder value of each. In compiling this list information has been gathered from sources other than the reports furnished by officers of the Lands Department and the Department of Agriculture and Stock. These other sources of information are acknowledged separately.

From the reports submitted it appears that in some cases a diminution in the amount of Mitchell grass has taken place. Generally speaking, however, where the country is not overstocked and where sufficient rain fell, the Mitchell grasses are as good as ever they were. In those areas where a diminution in the amount of Mitchell grasses was reported overstocking has been indulged in for a long period of years, and this, coupled with prolonged dry periods, has resulted in the gradual disappearance of the Mitchell grasses. The depasturing of horses upon them seems to have a harmful effect upon the Mitchell grasses. The horses eat the seed-heads and paw up the tusssocks, thus preventing the regeneration of the Mitchell grasses from seed or from the old roots.

Apart from the valuable notes received on the response of the Mitchell grasses, much information was received concerning the distribution and fodder value of some of the less widely known grasses and herbage plants. This information will be found set out in detail in the second part of the report.

The results obtained from the circular were certainly worth while, and the reports received have widened considerably our knowledge of the Queensland pastures.

That considerable interest is being taken in the management of the Western pastures is evident from the fact that some of the major pastoral companies have appointed pastoral research officers either to work on their own or in conjunction with the Council for Scientific and Industrial Research. The Walter and Eliza Hall Fellowship in Economic Biology was in March, 1934, awarded to Mr. S. T. Blake for the purpose of investigating the pastures of Western Queensland. These officers, particularly Mr. Blake, have worked in close co-operation with this Department. It is to be sincerely hoped that the outcome of this work will be that broad principles regarding the management of the Queensland pastures can be laid down.

PART I.

The Mitchell Grasses of the Warrego District of Western Queensland.

I. Introduction.
II. The Kinds of Mitchell Grasses.
III. Characteristics of the Mitchell Grasses.
IV. Mitchell and Flinders Grasses Compared.
V. Mitchell Grasses and their Resistance to Drought and Stock.
VI. The Past and Present Condition of the Ward Plain.
VII. Are the Mitchell Grasses Diminishing?
VIII. The Rainfall and its Effect.
IX. Suggested Tests and Experiments.
X. Some Grasses Associated with Mitchell Grasses.

I. Introduction.

THIS report outlines the results of a visit to some of the Mitchell Grass areas of the Charleville district. The visit was made in co-operation with Mr. E. J. Tannock, the District Inspector of Stock. The area visited extends about 80 miles south and 70 miles north of Charleville. The purpose of the visit was to make some observations upon the grasses in the field and to ascertain the views of pastoralists and others upon the welfare of the principal grasses of the area.

The Mitchell grasses are confined to Australia. They are not limited to any one State. They are restricted to the inland parts of the continent, or at least they reach their greaest development there. In these inland areas the rainfall is comparatively low. The Mitchell grasses are seen at their best in the areas with an average annual rainfall of from 25 to 10 inches. Mostly, if not always, these grasses are found in the richest lands. They inhabit wide plains and extensive undulating downs composed of rich, deep, black, and brown soils. In

such areas they are often the dominant components of the grass lands. On account of the very extensive areas of Western Queensland which are covered by them and because of their durable and nutritive properties the Mitchell grasses must be recognised as one of the principal natural assets of Queensland.

II. The Kinds of Mitchell Grasses.

Four different kinds of Mitchell grasses are recognised by botanists. Our knowledge of the classification of the Mitchell grasses was considerably clarified by a paper published in 1928 in the Kew Bulletin by Mr. C. E. Hubbard, the distinguished specialist in grasses of the staff of the Royal Botanic Gardens, Kew, England.

The four different kinds are enumerated:—

1. *Mitchell Grass or Curly Mitchell Grass.*—This is by far the commonest of the Mitchell grasses, at least in the Charleville area. Apparently it is the most palatable of the group. The name Curly Mitchell grass owes its origin to the fact that the leaves, especially the older leaves, often bend downwards and inwards at the point and form

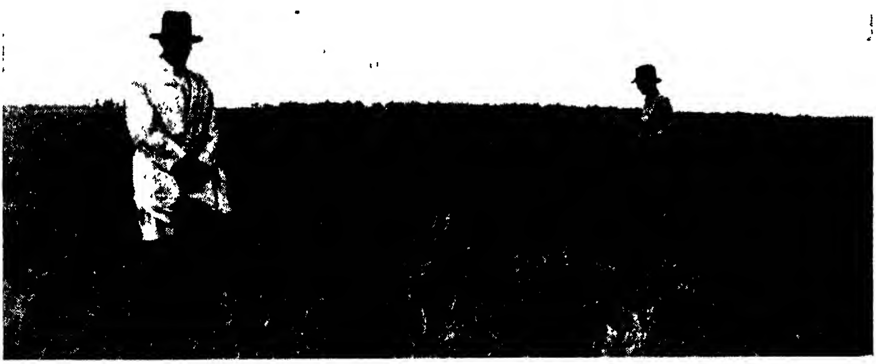


PLATE 121.

Curly Mitchell Grass (*Astrebla lappacea*) on Claverton, between Charleville and Cunnamulla. Forest vegetation on sky line. Mr. Tannock and Mr. McInnes in picture.

a circle or spiral. The leaves in the other kinds of Mitchell grasses often have the same tendency. This character therefore is not a reliable one upon which to distinguish this species. The botanical name of this species is *Astrebla lappacea.* (See Plates 121 and 123.)

2. *Barley Mitchell Grass.*—This species is distinguished from Curly Mitchell grass by its shorter and more compact seed-head, which is often enclosed at maturity on one side in a sheath. The seed-head of Barley Mitchell grass measures from 1½ to 5 inches long. This species is found in damper situations and in harder soils than Curly Mitchell grass. At times it grows on the margins of damp or low-lying places which are occupied by Bull Mitchell. It is often found in association with Bull and Hoop Mitchell. Its botanical name is *Astrebla pectinata.*

3. ***Bull Mitchell or Wheat-eared Mitchell Grass.***—This is a coarse-growing grass with strong, prominent tall stems and a large, heavy, broad seed-head. It is commonly found in patches especially in damp and low-lying situations. It is generally regarded as much inferior to the two foregoing kinds. Its botanical name is *Astrebla squarrosa.* (See Plate 122.)

4. *Hoop Mitchell or Weeping Mitchell Grass.*—This kind is mostly readily recognised by its long, slender seed-heads often bent into a circle or semi-circle, from which it derives the name of Hoop Mitchell. The seed-heads are much more slender than those of the other kinds and vary from 5 to 14 inches in length. It is often found on harder and damper soils than those upon which Curly Mitchell grows. It is generally regarded as inferior to Curly Mitchell grass. Its botanical name is *Astrebla elymoides.*

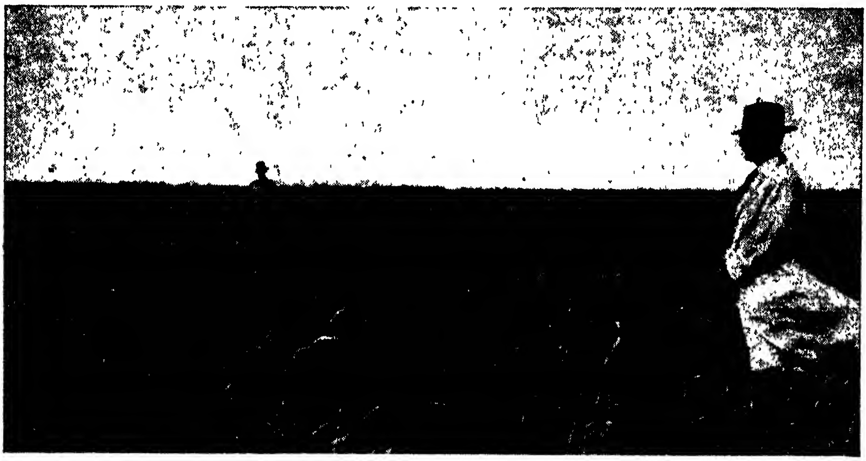


PLATE 122.

Bull Mitchell Grass (*Astrebla squarrosa*) in a slight depression on plain at Claverton, between Charleville and Cunnamulla. The tussocks are evident. In the foreground seed-heads of the grass are seen.

The four kinds of Mitchell grasses are represented in the Charleville area. Sometimes the four kinds were found in the one paddock. The great bulk of the Mitchell grasses seen by Mr. Tannock and myself on the downs and plain country of the Charleville district consisted of Curly Mitchell. The other three kinds formed only a very small proportion of the Mitchell grasses seen in the area.

In one instance a considerable portion of a plain occupied by Barley Mitchell was pointed out to us as consisting originally of clay pan. It was explained to us that sheep first introduced the seed on to the clay pan and tramped it in. Later germination of the seed took place and the grass eventually spread and formed almost a pure stand of this species.

III. Characteristics of the Mitchell Grasses.

The Mitchell grasses are perennials. They commonly grow in tufts or tussocks (see Plates 121, 122, and 123). Although the following observations particularly apply to Curly Mitchell grass, they are also true to a certain extent of the other kinds.

The tufts or tussocks of Curly Mitchell grass vary considerably in size. When large they often exceed one foot across and sometimes consist of over 100 stems. In densely grassed country the tufts or tussocks of the grass are close to each other. In thinly and sparsely grassed areas the tussocks are generally distantly spread, say, from 6 feet between tussocks.

The stems are upright or nearly so at the base and arise from a hardened, creeping root-stock which is mostly situated beneath the surface of the soil. The stems are firm or even hard. The leaves are also firm in texture, and, so far as I have observed, they lack the succulence which is a feature of many valuable Australian grasses of a softer character such as Shot grass (*Paspalidium globoideum*), Dairy grass (*Eriochloa* sp.), &c. These two soft-textured grasses occur in the Charleville district and are referred to in a later part of this report.

PLATE 123.

Excavating and examining the roots of Curly Mitchell Grass (*Astrebla lappacea*) on black-soil downs at Oakwood, about 60 miles north of Charleville. The picture shows a pure stand of the grass. Messrs. Willis, Tannock, and White in picture.

The lack of succulence in mature Mitchell grasses probably contributes to their durability, which is one of their most conspicuous and valuable economic features.

The root-stock of the Mitchell grasses is of great importance when considering the persistence of these grasses through periods of drought and constant grazing by stock. The strongly perennial character of these grasses is due to the durable and life-retaining character of the root-stock. The life-retaining properties of the root-stock are due in some measure to the hardened character of its tissues and to the sheathing scales enveloping it. The root-stock branches freely and mostly measures $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. The direction and extent of its growth determines the shape at ground level of the tufts of stems or tussocks. Large numbers of robust roots spring from the root-stock and pass downwards into the soil. By means of this strongly developed system of roots penetrating downwards for several feet into the soil, these grasses draw upon the last reserves of soil moisture and persist through dry weather and hardship.

The depth of soil penetration by the roots of the Curly Mitchell grass was studied on black-soil downs country north of Charleville (see Plate 123). It was found by digging that the roots terminated at a depth of 4 feet from the soil surface. At this depth the texture of the soil appeared to be still favourable for soil penetration. It did not appear that the soil texture formed any obstacle to further penetration by the roots. The roots for the first 2 feet were strong and hard and apparently of a texture similar to that of the root-stock. From 2 feet downwards the diminution in size and hardness was noticeable. The very small roots found from the 2-feet level down to 4 feet were often flattened in shape and easily broken.

For the determination of the depth of root penetration an especially large tussock of the grass was chosen. The large size of the tussock is an indication of considerable age.

I have heard and, I think, read statements to the effect that Mitchell grass penetrates the soil to a depth of 20 feet. So far I have not met anyone who has personally observed such a great depth of soil penetration by this grass.

IV. Mitchell and Flinders Grasses Compared.

In several of their characteristics the Mitchell grasses are strongly contrasted with the Flinders grasses. The common kind of Flinders grass in the area covered by Mr. Tannock and myself in the Charleville district is *Iseilema membranacea* (*Iseilema actinostachys*). The annual character of this grass is strongly emphasised. Its roots are mostly only a few inches long and rarely appear to attain as much as 1 foot in length. It is readily pulled up. If often seeds when very small. One plant in full seed only measured 2⅝ inches in length, including seed-heads and leaves. It is a fragile plant which readily breaks up and is blown about or falls on the ground. The dismembered and broken parts of Flinders grass when blown into hollows and when lying on the ground are reported to provide much forage which is appreciated by stock. With the advent of rain, however, it soon decays and is lost to stock at least for a season. In texture it is much softer than the Mitchell grasses and is often reputed to be more palatable. As a matter of fact, many graziers state that their stock eat many other grasses and many herbs in preference to the Mitchell grasses. However, the durable and perennial character of the Mitchell grasses, combined with their nutritive properties, gives them pride of place far above all other forage plants in the wide areas in which they are dominant.

Many graziers report an increase of Flinders grass in their localities during the present season. Mr. Tannock and I saw pure stands of this grass in some places, but pastures composed almost solely of it were not common.

V. Mitchell Grasses and their Resistance to Drought and Stock.

There can be no doubt that the Mitchell grasses, through their peculiar structure, texture, and other intrinsic properties, are extraordinarily resistant to drought and continued stocking. When considering this resistance attention is directed to the behaviour of the root-stock. The root-stock's life-retaining capacity is an exceedingly important factor in the survival of the grass.

During periods of drought in areas which have been heavily stocked the stubble of the Mitchell grass tussocks is often visible. Frequently it is bleached or at times it becomes darkened. We were often told that stock in dry seasons paw the ground to unearth the root-stocks, which they eat.

The question as to whether Mitchell grasses are diminishing was discussed with many pastoralists, drovers, and stockmen. Opinions on this subject are conflicting. Those who maintain that there is no thinning out of the Mitchell grasses state that they are just as prevalent now as they were in the past. Some of the men who discussed the matter with Mr. Tannock and myself stated that late summer rains are required for the growth of Mitchell grasses, that early rains, say, in the spring, bring up large quantities of herbage and these prevent the Mitchell grasses coming through later on in the season if rain falls. One grazier stated that he had observed that the root-stock of Mitchell grasses responded to both early and late summer rains, and that the seed germinated only with late summer rains. In some cases it was stated that Mitchell grasses had increased on some properties. A large proportion of those who contend that the grasses are not decreasing were connected with properties which had been lightly stocked or at least not overstocked. Those of the opposite opinion state that there is a noticeable diminution in the Mitchell grasses in areas which have been heavily stocked over a long period of years.

There were at least four experienced men who stated that horses are very severe on the Mitchell grasses. According to thir observations, horses are especially fond of the seed-heads, and when the grasses are in seed they regularly eat off the seed-heads. On this account, we were told, the horse paddocks of pastoral properties are often to be distinguished from other paddocks by the scarcity or shortness of the Mitchell grasses.

VI. The Past and Present Condition of the Ward Plain.

The part of the Ward Plain with which we are particularly concerned is about 10-12 miles in a north-westerly direction from Charleville. The stock route traversing the plain is from 1 to 2 miles wide in this locality.

From the fact that it is close to Charleville and is open to travelling stock, the stock-route portion of the plain has been very closely grazed over for a long period of years. The dominant plants on it to-day are salt weeds and small burr plants such as *Threlkeldia proceriflora*, *Bassia echinopsila*, *Bassia anisacanthoides*, and *Atriplex Muelleri*. At the time of our visit (March) there was a small amount of Flinders grass (*Iseilema membranacea*) and Curly Mitchell grass (*Astrebla lappacea*). All of these plants are native species (see Plate 124).

In the course of inquiries Mr. Tannock and I were able to ascertain from an authentic source that Mitchell grasses were very plentiful on this area thirty to forty years ago. This information was corroborated by a statement from an independent source. We were informed that about forty years ago the Mitchell grasses were so thick that they were readily mown down with a scythe, and the cut grass was taken in a cart to Charleville and sold.

Since that time the Ward Plain has undergone a great change. The Mitchell grasses are certainly far from common there now. In many parts of the plain these grasses are now absent or very rare.

We were informed that Mitchell grasses have not been plentiful on the Ward Plain for twenty years.

The stock-route portion of the Ward Plain is probably an extreme example of severe over-stocking over an extended period.

PLATE 124.

The stock route on the Ward Plain, about 12 miles north-west of Charleville. The vegetation shown in the foreground consists of low-growing Salt Weed (*Threlkeldia procoriflora*) and two low-growing burr-bearing plants (*Bassia echinopsila* and *B. anisacanthoides*). Mr. Tannock in picture.

VII. Are the Mitchell Grasses Diminishing?

From the examples of the destructive effects of horses which were shown to us and from the present condition of the stock route on the Ward Plain, it appears to us that Mitchell grasses are destroyed by continuous overstocking over an extended period of years, including drought years. In view of this conclusion we are of the opinion that at least some of the reports as to the diminution of Mitchell grasses in heavily overstocked areas are correct. With continuous overstocking and the incidence of droughts the root-stocks of the Mitchell grasses tend to die out. The dead root-stocks when dug up crumble rapidly to a powder in the fingers.

As suggested by some of the pastoralists, it is very desirable where possible to allow the Mitchell grasses to seed freely. We were informed that this practice is carried out by some pastoralists. The desirability of not overstocking is too obvious to need any special mention. It must, too, be recognised that there may be many cases where economic conditions will not allow of the execution of desirable precautions aimed at the maintenance and spread of the Mitchell grasses.

From the information we collected and from reports sent to the Government Botanist it is evident that the diminution in the Mitchell grasses is not confined to any one State or to any particular district. On the other hand, it should not be inferred from these remarks that the diminution is general. Many of the holdings seen by Mr. Tannock and myself were heavily grassed, and there were no reasons to believe that damage of any kind had been done to the grasses.

Apart from the statement that Mitchell grasses germinate with summer and late summer rains, we were not able to ascertain much information about the germination of the seed. We were informed that young seedlings resulting from germination brought on by one fall of rain were sometimes destroyed by hot, dry weather. In another quarter we were informed that the young seedlings are often pulled out by grazing stock.

VIII. The Rainfall and its Effect.

At least two men connected with stations claimed that there has been a decided shortage in the rainfall during the past few years. According to these men this shortage of rain, as well as overstocking, has contributed to the diminution of Mitchell grasses in some areas. One of these men, when asked how he arrived at the conclusion as to a shortage of rain, replied that considerably larger quantities of water had to be supplied to stock in recent years than in earlier years. He was further of the opinion that on account of the shrinkage in rainfall the soil-moisture level had retreated downwards, and in many cases the Mitchell grass roots had been unable to attain this moisture level and the grass died in consequence.

We heard indirectly that the statement has been made by some of the very early residents that the rainfall was much heavier in the very early days of settlement, because sheep thrived without artificial supplies of water in areas in which this would be impossible now. This circumstance is mentioned because it may possibly be of some interest in view of the rainfall figures given below, especially those of the decade 1893-1884. In this decade the rainfall was considerably above the average.

In view of the above statements as to the alleged shortage of rainfall in recent years, a visit was paid to the Divisional Meteorological Bureau, Brisbane. There I interviewed Mr. Hartshorn, First Meterological Assistant. In reply to my inquiries Mr. Hartshorn informed me that he was not aware of any decrease in western rainfalls, but kindly gave me access to the official records and much valuable assistance. With the records at hand the average rainfall was computed for each decade dating backwards into the past from the end of 1933. Thus the first decade begins with 31st December, 1933, and ends with the 1st January, 1924. The following table shows the results:—

Station.	General Average.	Average 1933-1924.	Average 1923-1914.	Average 1913-1904	Average 1903-1894.	Average 1893-1884
Charleville ..	19·59	17·62	19·28	20·87	17·05	23·32
Cunnamulla	14·24	12·80	13·80	13·35	11·23	18·12
Tambo ..	21·44	19·61	21·0	23·12	17·66	Incomplete
Eulo	11·96	10·44	12·26	10·73	10·24	Incomplete
Hungerford	11·09	9·04	10·0	10·89	10·56	15·22
Morven ..	21·63	22·03	21·37	22·64	17·39	Incomplete

From the above table it is seen that there has been a considerable diminution in the rainfalls of Charleville, Cunnamulla, Eulo, Hungerford, and Tambo. Morven is exceptional, as there has been an increase over the general average during the decade just passed. Morven is nearer to the east than the other stations, and meteorological influences other than those at the other recording stations may operate there.

Considering the first decade dating back from 1933, the percentage diminution of rainfall from the general average has been 10 per cent. at Charleville and Cunnamulla, 12½ per cent. at Eulo, 18 per cent. at Hungerford, and 8½ per cent. at Tambo.

Bearing in mind that these percentages diminutions are spread over a period of ten years, it would appear that they represent a considerable shortage of rain. It is quite feasible, then, that this shortage has adversely affected the Mitchell grasses in common with other vegetation.

The rainfall averages for the decade 1903-1894 show a very dry period at all stations, and the figures in the table can be compared with those of the decade just passed (1933-1924).

Some interest also attaches to the figures for 1893-1884, where they are available. The figures here are encouragingly high. They are encouraging because they suggest that such seasons may recur. One naturally asks if this decade represented the seasons of plenitude in which old residents claim that artificially supplied water was not required in certain localities.

IX. Suggested Tests and Experiments.

It is very desirable to obtain accurate information on at least two points. The response of overstocked areas to the removal of stock from them for varying periods of time is one important point. Another subject which should amply repay investigation is the germinating properties of Mitchell grass seed. The seed of Curly Mitchell grass is referred to here. With accurate information concerning the germination of the seed, some productive and readily applied method of pasture treatment may be arrived at. The fact that much of the western areas during severe drought periods appears bare and after rain is transformed into wide expanses of luxuriant vegetation indicates that seeds play an exceptionally important part in carrying different species of plants through dry periods.

Possibly there are peculiarities in the germination of Mitchell grass seed which may be utilised in spreading the species. In any case it is as well to ascertain how long the seed is likely to last in the soil.

It is suggested that a quantity of Mitchell grass seed be obtained and stored in suitable receptacles at Charleville. The seed could be left in charge of Mr. E. J. Tannock, the District Inspector of Stock. A certain number of the seeds could be tested each year by the Pure Seeds Branch of the Department of Agriculture and Stock. In this way it could be ascertained if there are any peculiarities with respect to germination and age in the seeds.

The stock-route portion of the Ward Plain would provide a suitable area on which to study the effect of closing an area to stock. If it is practicable to keep stock off a small portion, say, 20 acres, of this area, the progress of the Mitchell grasses on it could be observed. We

discussed this matter with some of the pastoralists of Charleville. They unanimously agreed that it would be extremely interesting to carry such a plan into effect. The difficulty of keeping the area, when it is fenced, free of stock was emphasised. After the area has been shut up for some time the fresh feed in it will constitute a considerable temptation, and the fence may be cut to allow hungry stock into the fresh feed. However, this difficulty may not be insurmountable. If this Department, with the sanction of the Department of Public Lands, decides to make this trial, Mr. E. J. Tannock, District Inspector of Stock, in co-operation with the Warrego Shire Council, may be able to devise some means of keeping stock off the preserved area. If it is found impracticable to close off a portion of the stock route on the Ward Plain, perhaps some other closely eaten-over area could be treated. In that event it would be necessary to ensure that the chosen area had been Mitchell grass country.

Once a suitable area is secured against invasion by stock the progress of the grasses and other vegetation could be carefully studied. As soon as the area is shut off a botanical survey of it should be made. Chosen areas could be photographed with a large-sized camera in order to show the aspect and distribution of the various grasses and plants. This photographic work could be effectively carried out by the Government Photographer attached to the Department of Agriculture and Stock. The botanical surveys and photographic studies could be made at suitable intervals so that permanent records could be made of the changes brought about by the absence of stock. By such means as these considerable light may be thrown on the problem of regeneration of Mitchell grasses. It is quite possible, too, that some of the results accruing from the fenced-off area may be correlated with laboratory germination tests of the seed.

As already mentioned, two burr-bearing plants (*Bassia echinopsila* and *Bassia anisacanthoides*) are very common constituents of the vegetation of the Ward Plain. The fencing-off trial may possibly indicate some means of controlling the spread of these and allied plants, such as the Galvanised Burr (*Bassia Birchii*).

In view of the remarks under the section "Rainfall and its Effect," it is clear that data on the distribution of soil moisture may prove to be valuable. Especially is it desirable to obtain information concerning the moisture at various levels in the soil from the surface down to about 4 feet. The growth rate of the Mitchell grasses and other plants may be found to be correlated with certain percentage distributions of moisture at various soil depths. The Agricultural Chemist could be asked to furnish further details on this point. Naturally it would be most desirable that such moisture determinations should be carried out periodically on the fenced-off plot already referred to. If soil moisture determinations are to be made at the proposed observation plot, it would naturally be advantageous to have a rain gauge on the area and keep records of the rainfalls.

X. Some Grasses Associated with Mitchell Grasses.

Blue grass (*Dichanthium sericeum*) is common in some parts, especially to the north-east of Charleville. We were informed by the manager of a large station that Blue grass is brought on by early rains, say, November to January; that rains in March and April favour

Mitchell grasses; that when Blue grass is heavy there is less Mitchell; that when Blue grass is light there is a heavier growth of Mitchell; and that there was more Mitchell on his holding during the last three years than before.

It may be worth mentioning here that we were informed that some of the older residents of the country north of Charleville state that Blue grass once covered the country now occupied by the Mitchell grasses. We heard this of more than one area north of Charleville, but the statements in each case only reached us indirectly. If observations in the future indicate that there are more or less marked successions or cycles of vegetation in certain areas, these statements concerning the prevalence of Blue grass in the past may prove of interest. Blue grass has a good reputation, but does not appear to have the durable properties of the Mitchell grasses, as according to reports it appears to be more susceptible to disruption and decay.

PLATE 125.

Brown top Grass (*Eulalia fulva*) on plain at Wallal, 12 miles south of Charleville. The dark streaks represent the brown seed heads of the grass.

Brown Top was met with occasionally in Mitchell grass country. This grass is sometimes locally known as Brown-top Blue grass. It is referred to by botanists as *Eulalia fulva*. It was most commonly found on low-lying ground Occasionally it was interspersed with Bull Mitchell. The leaves and stems are mostly greyish green or reddish in colour. That it is palatable in western areas is evident from the way it is eaten down by stock (see Plate 125).

A tall Rat's Tail grass (*Thellungia advena*) was often seen in the Mitchell grass country. This is a tough grass which grows in tussocks. The leaves at the base of the stem were often eaten off, indicating that it provides some feed for stock Another grass with a scattered distribution in Mitchell grass country is Early Spring grass or Dairy grass (*Eriochloa* sp.). This is a fairly succulent grass with a high reputation for palatability. Shot grass (*Paspalidium globoideum*) was less frequent than the two preceding species. It was seen chiefly in damp

places and along bore drains. Its name is derived from the resemblance of its seed to shot. It is a succulent grass with a high reputation for palatability.

PLATE 126.

Mulga country, about 6 miles south of Charleville. The trees shown are Mulgas (*Acacia aneura*). The leaves and shoots of the Mulga are readily eaten by stock. This type of country is a very valuable standby in droughts.

Acknowledgments.

The writer is especially indebted to Mr. E. J. Tannock, District Inspector of Stock, for his very able co-operation in all the field work. Several questions were discussed with Mr. C. T. White, Government Botanist, and his assistance is gratefully acknowledged. To all of those who so kindly extended hospitality to us and to those who unreservedly placed their experience at our disposal cordial acknowledgment is expressed.

NOTE.—*Part II. of this article will appear in the April "Agricultural Journal."*

Mammitis.

By K. S. McINTOSH, B.V.Sc., H.D.A., Veterinary Officer (Animal Health Station).

MAMMITIS or, as it is sometimes called, mastitis, is a disease of the udder of cows and is well known to many dairy men throughout Australia, and practically all other countries in the world.

The annual economic loss caused by this disease by diminished milk production is difficult to estimate, but judging by its prevalence must be enormous.

To appreciate the explanation of the disease we must first consider the structure of the normal udder. The udder consists of two large milk secreting glands which lie side by side and are separated by a distinct wall or septum. Each of these glands is again divided into two separate portions, and thus the udder consists of four quarters.

If we examine a portion of the gland substance of the udder under the microscope, we find that it is composed of tiny chambers which empty by means of minute tubes. It is in these chambers that the milk is manufactured and then drained away by means of the minute tubes. The tubes pass downwards and are jointed by many others forming larger ones, which eventually empty into a milk cistern or reservoir, one of which is situated at the upper end of each teat.

From the milk cistern a wide milk duct or teat canal passes down the centre of each teat to its external opening. This opening is normally closed by a circular muscle, except, of course, during the process of milking when pressure is exerted by the hands to force the milk through. The udder is thus a complicated and delicate arrangement of glands and their corresponding milk tubes. The whole of these structures is supported by a delicate framework of connective tissue and supplied with nourishment by innumerable tiny blood vessels.

Mammitis simply means inflammation of the udder. Apart from wounds and bruises, there are several diseases which cause inflammation of the udder, including tuberculosis, actinomycosis, contagious mammitis, and acute non-specific mammitis.

In these notes the two usual forms—contagious mammitis and acute non-specific mammitis—will be dealt with.

Contagious Mammitis.

Contagious mammitis is a chronic inflammation of the udder caused by one of several special kinds of germ, the commonest being Streptococcus of mammitis.

Although this germ grows best in the udder of a cow, it also lives for long periods in dust, &c., particularly if it is not exposed to the action of disinfectants or sunlight. It is conveyed from one cow to another by the hands of milkers, by milking machines or by contaminated dust. Having gained entrance to the teat canal, the germ does not take long to invade the remainder of that quarter of the udder, establish itself by rapid multiplication and set up a chronic type of inflammation.

The first symptom of inflammation may be a pinkish tint in the milk, due to the presence of blood; or the milk may be reduced in

quantity and altered in appearance. Often there is a secretion of watery fluid containing small yellowish particles of pus. Later nothing but thick yellow pus can be milked from the affected part.

One or more quarters may become affected, and as the disease progresses the gland tissue is destroyed and replaced by an overgrowth of the fibrous tissue framework of the udder. The normal udder has a soft flabby feel when empty, but the udder affected with old-standing mammitis has a hard lumpy or knotty texture due to old abscesses and masses of fibrous tissue.

In time, perhaps, when the cow is dried off, the affected quarter or quarters partially or completely cease to function.

The disease is slow and insidious in its progress, often leading the farmer to believe that the cow is only suffering from a chill, the result being that it may be well established in the herd before the seriousness of the position is realised.

Prevention.

The main thing to bear in mind is that the disease is contagious, so, firstly, be extremely careful when purchasing a cow to avoid introducing the disease into the herd. Care should be taken to examine the udder and milk, and to obtain a reliable history regarding the health of the rest of the herd from which she comes.

A handy method of examining the milk is to strain it as it is drawn through a piece of black cloth. This will enable you to detect any small clots or pieces of pus.

Once the disease is discovered in the herd, isolate the affected cows by running them in a separate paddock and milk them after the balance of the herd is finished.

Do not milk pus, &c., on to the floor of the bails, as in this way the germs contaminate dust and spread the disease. All abnormal milk and pus should be stripped into a bucket or kerosene tin containing disinfectant and later disposed of by burying.

Wash the hands thoroughly and dry them on a clean towel after milking each cow. Wash the teats and udder of the cow before milking in a clean weak solution of Condy's crystals.

Treatment.

The next thing to consider is treatment. This consists of general, local, and inoculation.

By general treatment is meant keeping the cow in good general health by proper feeding and, if necessary, rugging her during cold weather; also give her a dose of 10 ounces of Epsom salts and 2 ounces of ginger. This will assist her to eliminate any poisons which she has absorbed from the diseased udder.

The local treatment consists of stripping the cow thoroughly at least three times per day; oftener if possible. During and after the stripping the udder should be massaged with some mild liniment such as soap liniment. The object of this is to press as much pus as possible from the gland substance and remove it by stripping. In other words, it is an attempt to drain the pus from the udder.

Vaccination.

Vaccination is the injection under the skin of the animal of an enormous number of dead germs of the same type as those which cause the disease.

As the germs are dead they cannot set up an attack of the disease, but they can and do stimulate the production of defensive substances in the tissues of the animal which if sufficiently strong will control the infection in the udder.

The ideal vaccine to use is one which is made from the animal or herd which is to be treated. To do this a clean bottle is boiled and corked to kill any germs which may already be in it. The affected teat is then carefully washed and dried and the first squirt of milk expressed. The sample taken should consist of the second, third, and last squirts of milk.

At the Animal Health Station, Yeerongpilly, numerous vaccines are made throughout the year for various stockowners, and the procedure is somewhat like this:—

A bottle of milk from a suspected cow is received and examined to determine what disease producing germs it contains. A small quantity is then sown on culture media on which the germs grow. Quite a number of colonies appear after twenty-four hours, but the ones which cause mammitis are recognised by their appearance.

These particular colonies are then carefully removed by means of a sterilised needle and grown in sterilised broth for forty-eight hours. After this time a small quantity of antiseptic is added which soon kills the germs.

This now constitutes the crude vaccine which is ready for use after it has been standardised and tested in various ways to make sure it will be effective but not harmful in any way to the animal.

Vaccine treatment strikes at the very root of the trouble, but it must not be regarded as a miracle which will obviate any necessity for the prevention and other general and local treatment which has already been dealt with. It is an extremely useful method of preventing animals from contracting the disease, and is also a curative in larger doses.

To obtain some record of its effectiveness in the field, farmers were asked to comment on their experience with its use. In practically all cases where the vaccine was used properly very favourable reports came to hand.

For many years vendors of proprietary medicines have been selling substances to inject into the udder to cure mammitis. We have already noted the extreme complexity and delicacy of the udder tissue, and from this it can easily be realised that it is practically impossible to reach the small milk manufacturing chambers high up in the udder with any antiseptic. In addition, most antiseptics which would kill the mammitis germs would also destroy the milk secreting glands of the udder. Thus the Department cannot as yet recommend any of these udder injections for the treatment of mammitis.

Non-specific Acute Mammitis.

This form of mammitis is not caused by any particular germ, but rather by invasion of the udder by numerous types.

It is commonly seen soon after calving, after the use of a dirty or non-sterilised milking tube, or after injury, exposure to cold and wet, &c.

First, the udder becomes inflamed, enlarged, hot, and painful. The flow of milk practically ceases, the cow goes off her feed.

Treatment should be adopted as soon as the case is noticed. Give the cow 1 lb. of Epsom salts and 2 ounces of ginger in a quart of water.

The udder should be bathed and stripped out every two hours and the cow kept in a dry comfortable stall or paddock. At each stripping when the inflammation and pain has subsided somewhat the udder should be massaged, but not vigorously enough to cause unnecessary pain. Any abscesses which form on the surface of the udder should be opened and flushed out with weak antiseptic.

With this form of mammitis, treatment must be thorough and energetic, otherwise the cow may lose one or more quarters or, perhaps, even die.

TANNING FUR SKINS.

"Lightning" Process and the Wattle Bark Method.

The "Agricultural Gazette" of New South Wales, in discussing recipes for tanning fur skins, says that the "lightning process" is much quicker than wattle-bark tanning but, while quite effective, is not as good as the latter method.

THE "LIGHTNING" PROCESS.—Cut off the useless parts of the skin and then soften it by soaking, so that all flesh and fat may be scraped from the inside with a blunt knife. Soak the skin next in warm water for an hour, and during that time mix equal quantities of borax, saltpetre, and Glauber salts with enough water to make a thin paste. About half an ounce of each ingredient will give enough for a small skin, and proportionately more will be required for larger ones. When the skin has soaked in the warm water, lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin; more paste will be required where the skin is thick than where it is thin. Double the skin together, flesh side inwards, and place it in a cool place for twenty-four hours, at the end of which time it should be washed clean and treated in the same way as before with a mixture of 1 oz. sodium carbonate (washing soda), ½ oz. borax, and 2 oz. hard white soap; these must be melted together slowly without being allowed to boil. The skin should then be folded together again and put in a warm place for twenty-four hours. After this, dissolve 4 oz. alum, 8 oz. salt, and 2 oz. sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin: the water used should be soft, preferably rain water. When this is cool enough not to scald the hands, the skin should be immersed and left for twelve hours; then wring it out and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed smooth with fine sandpaper and pumice-stone.

WATTLE-BARK TANNING.—The second method, in which wattle-bark is the tanning agent, though not so quickly accomplished, should give better results.

Collect some wattle-bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark from a tannery, if one is near at hand, will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the "lightning" process, before steeping begins. It is best to let the skin lie as flat as possible while soaking; and a large, square, zinc-lined packing-case is therefore preferable to a barrel. The skins should be completely covered by the liquid, which must either be changed once a week or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but small skins will not require more than a month.

Use and Care of Milking Machines.

IT frequently comes to the notice of the Department that milking machines are discarded by dairy farmers allegedly owing to the production of lower-grade cream. It is generally found, however, that lack of suitable attention on the part of the dairy farmer is the primary cause. As the milking machine is one of the greatest factors in dairying economics, the following instructions in regard to their use and care are re-issued.

With proper care and attention to cleanliness machines will deliver first-class produce.

Milking.

Keep the milking shed, yards, and surroundings in a clean, sanitary condition. Wash the cows' teats in clean water, and draw milk from each teat and ascertain if the milk is normal before putting on the teat cups. To place the teat cups in position bend them all down except the one you are going to attach to the teat; attach each cup in like manner. When the cups are all attached and the milking is proceeding satisfactorily, do not interfere with the machines until the cow is milked out. See that no air enters the cups and destroys the vacuum; this defect is indicated by a hissing sound caused by the air rushing into the cups.

Should a cup fall off the teats give it immediate attention, as the suction will draw dust and particles of dirt into the system and contaminate the milk.

The cleansing of the milking machines is one of the most important parts of the dairyman's operations. Failure to thoroughly wash and properly cleanse the plant after each milking will result in the production of low-grade milk, cream, and dairy products.

Cleansing the Machines.

After completion of milking do not delay in carrying out this important work, which will, if properly performed, materially assist in producing high-grade milk.

Turn off the air tap in each bail. Start at the end bail and clean adhering particles of dirt from the outside of the cups and claws so as to prevent the dirt entering the flushing water. Then thoroughly flush each unit in turn by drawing through it at least half a bucket of cold water, dipping the cups in and out of the water so as to draw in air during the flushing. A thorough flushing out with cold water will remove traces of milk from the rubber teat cups, pipes, releaser, &c. Always use cold water for this flushing. On no account should hot water be used, as it will tend to cause casein to become caked on the inside of the pipes. Scalding water at a temperature of at least 180 deg. Fahr., to which may be added one tablespoonful of washing soda to every 2 gallons, should then be drawn through the cups and pipes, care being taken to admit the water slowly at first in order to gradually heat the sight glass so as to prevent its breakage. Thoroughly clean the milk pipe line by means of the brush supplied with the machine, and according to instructions. The air pipes and vacuum tank, which frequently become foul owing to milk vapours entering and condensing in them, should be regularly cleansed and sterilised with boiling water. With

machines in which water can be drawn through the air pipes by means of the vacuum pump, care should be taken not to flood the vacuum pan, thereby causing the water to get into the pump. The sterilisation of dairy appliances and equipment is most effectively and economically done by boiling water, and where it can be utilised nothing is usually gained by the addition of chemical disinfectants. When the cleansing of the piping is completed, open all taps and leave the pump running for a few minutes to dry out the pipe line. This assists in keeping the plant in a sanitary condition. Leave all pipes open when the plant is not in use, so as to allow the air to circulate through the system. The releaser should be detached, thoroughly cleansed, and allowed to dry.

Cleansing the Teat Cups.

When the flushing out of the machine as described has been completed, remove the teat cups and rubber connections. Dissemble the cups, and carefully brush the cups and claws with a dairy scrubbing brush. This should be done in hot water in which soda or a cleansing powder has been dissolved. It is essential to remove all grease in the first flushing and to then brush and cleanse the rubbers. If the rubber inflations have not been thoroughly cleansed they will be sticky to the touch, which is an indication of a film of grease on the rubber. The surface of a well-cleansed rubber will cling when the finger is rubbed along it. Careless cleansing will allow the grease to penetrate the surface of the rubber to the extent that it cannot be scoured out, and the rubber will perish. Rubbers so affected should be discarded. Careless cleansing of the inside of the teat cup cases gives rise to corrosion and pitting of the surface. Where cups have screw caps the cleansing of the threads should receive attention, and a slight smear of vaseline applied to threaded parts will assist in keeping them in good order. The dissembling and cleansing of cups and claws should be done as frequently as possible and not less than three times a week.

Cups and rubbers, after being cleansed, may be either left in an antiseptic solution or may be dipped in same for fifteen to twenty minutes, then removed and placed in a suitable receptacle in a cool place, away from the light, and protected from flies and dust. The vessel in which the disinfecting solution is held must be large enough to allow of the teat cups and rubbers being immersed in the solution without doubling the rubber tubes in a manner to prevent the complete displacement of air by the disinfecting solution.

Several solutions for dipping or soaking the cups and rubbers are recommended by manufacturers of the different milking plants, and include chlorine compounds, lime water and permanganate of potash, and brine solutions.

Special attention is drawn to the necessity of removing all traces of the solution that may be used for the sterilisation of the cups, rubbers, pipes, &c., that come in contact with milk, before the machine is again used. This is done by flushing each unit with sufficient hot water to effectively remove any trace of the solution before commencing to milk.

Many dairymen object to very hot water for cleansing rubber, believing that the rubber is destroyed. The judicious use of hot water will do no harm to rubber, provided that all grease is removed from the rubber before the hot water is applied. Rubber, if kept in water for ten to twenty minutes at a temperature of 165 to 175 deg., will be

unharmed by the heat, and most bacteria which detrimentally affect milk will be destroyed. If the rubber is placed in water at a temperature of from 180 to 190 deg. Fahr. long enough only for the surface of the rubber to be heated to the same temperature, the same object will be attained without injury to the rubber.

Lime a Suitable Disinfectant.

An efficient disinfecting solution is made by adding 2 lb. of quicklime to 10 gallons of water. Stir well and allow the solution to settle. Pour off the clear liquid and immerse teat cups and rubbers in it for a period of fifteen to twenty minutes.

MEN OF THE TREES.

PRESERVING A HERITAGE.

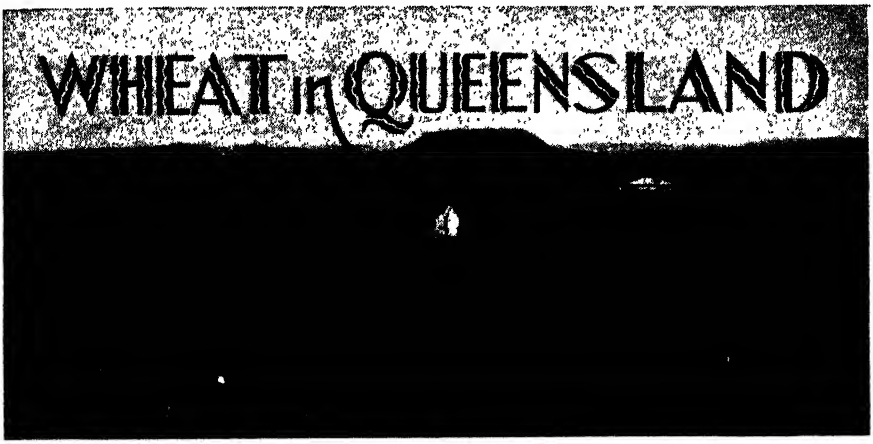
In an age when man's hand is tireless in despoiling nature, it is no small comfort to find that there is still a minority who think as R. L. Stevenson always thought, that "trees are the most civil society." Progress, mingling brutality with idealism, has denuded many countries of their forests, and of all countries England would seem to have suffered most. Vast tracts of her beautiful landscape have been ravished and lie under grass, with only an occasional tree to remind us of forgotten woods and glades. Millions of trees have been destroyed needlessly—millions could be planted again as an asset both to beauty and national wealth. And that is where "The Men of the Trees" hope to assert their influence.

"The Men of the Trees" is the picturesque name given to a voluntary society in England founded ten years ago by Mr. Richard St. Barbe Baker. Its aim, tersely expressed, is to develop a tree sense in every citizen, and to encourage all to plant, protect, and love trees everywhere. "What concerns us as Men of the Trees," says that society, "is that our country is being deprived of a permanent economic asset and the heritage of beauty which is characteristically British. Moreover, the continued destruction of trees cannot be disregarded, in view of the drought in many districts, and this drought is liable to become more serious unless remedial measures in the form of extensive reafforestation are put forward."

CULTIVATE A "TREE SENSE."

Though the exact relation of trees to rainfall is not easy to define, and may be treated as a subject of controversy, the principle may safely be laid down that forest areas lead to greater condensation both in the case of sea winds and the case of mountain mists. There is no doubt whatever that the climate of many rural localities in Britain has been gravely affected by the cutting down of forests and the failure to replace them. That much is to be admitted. But, apart altogether from that aspect of the question, the Men of the Trees are striving above everything to instil into the hearts of English people a "tree sense," which, once cultivated, will inevitably express itself in the transformation of the countryside. The society feels that everyone who plants trees is contributing a service to the nation, and for this reason should be assisted by relief from taxation. Woodlands which, for example, have been properly cared for by the owner or tenant, for life, should be exempt from death duties (these duties having levied a dreadful toll upon British forestry). Hundreds of great estates, thickly wooded for centuries, have been stripped of their timber in recent years to meet the demands of an inexorable and unimaginative Exchequer.

The society is constantly urging the planting of hedgerow trees and encouraging the planting of trees on a community basis. It is also offering prizes to schools for the best school plantation and organising arbor days and ceremonial tree plantings in memory of persons worthy of special honour. In addition it arranges periodical meetings, excursions, tree photographic exhibitions and competitions, lantern lectures, and parties for junior members. Expert advice on silviculture is given to all who ask for it, and several publications, including a highly artiste illustrated tree calendar, are regularly issued. Indeed, nothing that will assist in the attainment of its objectives is willingly left undone. First and last, the Men of the Trees are bent upon fulfilling the truth of Francis Thompson's noble words: "Thou can'st not stir a flower without troubling of a star."—J.R.W.T. in the "Sydney Morning Herald."



By H. W. BALL, Assistant Experimentalist.*

WHEAT has become the most important food of mankind, owing to its suitability for bread making, the simple cultivation required, and the crop's ready adaptability to differences of soil and climate.

The various forms and varieties of wheat are cultivated extensively in all agricultural countries with the exception of the more tropical regions, and it is interesting to know that wheat is being sown and harvested in one country or another the whole year round.

For most satisfactory growth, a cool moist growing season is required, followed by a bright dry ripening period of from six to eight weeks. In such favoured climates—Northern Europe and New Zealand provide examples—farmers secure an average yield of over 30 bushels per acre.

Wheat is the most important crop grown in Australia, being produced chiefly on those intercoastal areas having a rainfall of from 10 to 25 inches per annum. In Queensland, owing to its wider range of climatic conditions, and the diversity of its agriculture, wheat has not attained to the importance, relatively, that it has in the Southern States and Western Australia. Nevertheless, over 3,000,000 bushels from up to 300,000 acres of cultivation are produced annually in this State, although this quantity is not equal to Queensland requirements and has to be supplemented by Southern supplies.

On account of increasing consumption and seasonal variations, considerably more attention will have to be devoted to wheat growing before our State requirements are assured. Sufficient land is available, in the recognised wheat region, adjacent to the present railway system, and with the encouragement of payable prices, no other incentive would be necessary.

Value of the Industry.

Wheat growing already provides employment for over 3,000 farmers and their dependents, and also considerable employment in the transport, milling, and baking industries. Our record crop was produced

* In a broadcast address from A.B.C. Radio Station 4QG (Brisbane) and 4RK (Rockhampton).

in 1930—over 5,000,000 bushels, an average of over 18 bushels per acre. The average for the last ten years is over 14 bushels, and it is surprising to note that this exceeds the average of any mainland State in spite of the more capricious nature of our rainfall, only one-third of which falls during the growing period of the crop.

This higher average can largely be accounted for by the richness of the Queensland soils, especially those of the Darling Downs. Our climate also favours the production of superior, hard milling wheats of high gluten content.

The chief wheatgrowing centres in Queensland are Pittsworth, Allora, Clifton, Warwick, and Toowoomba, while some 20,000 acres are cropped in the Maranoa and a small area in the Dawson Valley and Central districts.

The largest individual areas are probably in the Pittsworth and Cecil Plains section, where endless seas of wheat present a most pleasing picture, especially during harvest when tractor-drawn header harvesters roar through the fields gathering hundreds of bags daily.

PLATE 127.—A FIELD OF PUSA WHEAT, WILLOWBURN HOSPITAL, TOOWOOMBA.

The Economic Position.

In recent years the price of wheat has fallen considerably in all countries, but the cost of land, machinery, and general necessities has not fallen to the same extent. Farmers, therefore, have need to consider ways and means of reducing their costs, in order to keep their business profitable. Increasing the yield per acre is an excellent way to accomplish this. If the standard of farming in every district could be raised to that of the most successful farmers, a considerable increase in acreage yields could be obtained. A study of cultural methods, soils, varieties, and seasonal variation will, therefore, help towards

the purpose in view. The essential points to observe will be outlined briefly.

Points in Field Practice.

As soon as possible after harvest it is advisable to burn the stubble, thus destroying fungous spores and putting the land in better condition for the first ploughing. This should be done when the land is neither too wet nor too dry, and should be not more than 4 to 5 inches deep, varying with the nature of the soil. This practice of early ploughing after harvest, and keeping the land free from weeds until sowing time, some four to five months, is termed summer fallowing, and is designed to conserve moisture for the use of the succeeding crop.

PLATE 128.—A FINE CROP OF CLARENDON WHEAT AT WILLOWBURN.

[*Photo.. Crook-King, Toowoomba.*

In the chief wheatgrowing States, the fallow period is much longer, being from nine to ten months, the land only producing one crop every two years. Under Queensland conditions, an occasional long fallow will be found useful in checking the spread of pests, such as wild oats. In some of the older settled districts long fallows, and the growing of fodder crops which can be grazed or cut before weed seeds mature are now becoming imperative, owing to the rapid spread of various weed pests. Sheep can be of great assistance in keeping the fallows clean, saving a considerable amount of cultivation, besides making good use of the weed growth.

Disc sundercut ploughs have become popular owing to their low cost of operation, but it is known that mould board ploughs will do better work on soil that is likely to break up too fine, and are also superior on land covered with weeds or rubbish.

Subsequent cultivation is best done with spring tooth or rigid tine cultivators and harrows, the object being to check weed growth, maintain a good mulch and bring about a desirable consolidation of the seed-bed prior to sowing.

On certain free working soils a method known as ploughless tillage is being tried, whereby rigid tined cultivators are used in place of the plough or disc cultivator. Excellent results are being obtained, combined with greater speed and reduced cost of working. The seeding is generally done with a cultivator drill or combine, this implement being excellent for sowing on a surface that has set after rain, and also where slight weed growth is present.

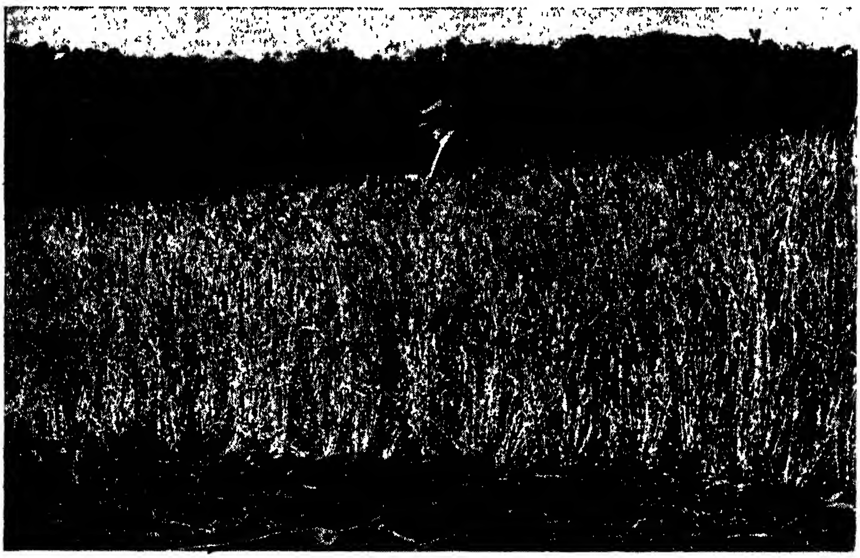


PLATE 129.—A FIELD OF GLUYAS WHEAT AT WILLOWBURN.

[*Photo.: Crook-King, Toowoomba.*

When to Sow Wheat.

The time to sow varies with the season, and may extend from May to July. Some farmers commence sowing the slower maturing varieties such as Currawa and Cleveland in April, and subsequently feed off the early growth to sheep. Sowing on moisture is the ideal method, putting the grain not more than 2 inches deep. Where conditions are favourable it is advisable to hurry the seeding as much as possible before the moisture is lost, for rapid sowing after a favourable seasonal rain is one of the most important factors in securing a good yield, particularly in the drier areas. Should rains be delayed and the soil sufficiently dry, it is usual to go ahead with the drilling, leaving the seed to await favourable rains, but with this method there is always a risk of light showers malting the grain, necessitating resowing.

Varieties.

The farmer has a wide choice of varieties and must largely determine for himself those that best suit his particular soil and climate. It is better to grow two or three varieties, rather than concentrate on

one which may not suit all seasons. Generally speaking, the short season or early wheats are more suited to the hot inland districts such as the Maranoa; whereas where the growing period is longer, the slower maturing varieties are capable of producing a heavier yield. No variety may be said to be perfect or to suit all conditions, which justifies the continued efforts to produce more desirable types.

Rust is one of the chief problems in Queensland, where warm humid conditions as the crop approaches maturity will often induce a severe infestation. The attempt to evolve rust-resistant varieties has met with a measure of success in the production of "Three Seas" and "Seafoam," which are similar rust-resistant types. There are many other varieties in general cultivation, such as Florence, Clarendon, Pusa, and Flora, all of which have good characteristics, but which will doubtless be superseded in due course by improved types. To illustrate the effectiveness of the Agricultural Department's work in wheat improvement it may be mentioned that varieties bred by Mr. Soutter at the Roma Experiment Farm now constitute approximately 40 per cent. of the entire Queensland crop.

PLATE 130.—AN AUTO-HEADER HEAD ON.
Mechanised Agriculture has attained a high standard in Queensland.

The rate of seeding varies from 30 to 60 lb. per acre, depending on the district, the time of sowing, the character of the grain, the variety, and whether sown for hay or grain production.

Harvesting.

Header-harvesters are now in general use for harvesting, and in successfully gathering many storm lain crops they have saved the growers many thousands of pounds.

However, there is every incentive to speed up harvesting operations whenever suitably fine weather prevails. The early summer storms often coincide with the harvest period; and although the grain may

be gathered, there is some loss of grade by bleaching and weathering. Wheat farming machinery is expensive, and it is desirable to ascertain the most economical unit necessary to handle a certain area. It is obviously better business to work a plant to full capacity, although, owing to the speed usually necessary at seeding and harvesting times, there is a limit to the area which can be adequately worked by one set of implements. It is here that the tractor owner has a distinct advantage.

PLATE 131.—HARVESTING WHEAT IN QUEENSLAND—WHERE "TIME IS THE ESSENCE OF THE CONTRACT."

Wheatgrowing as a Business.

Considerable capital is required to commence a modern wheat farm when the cost of the land, improvements, machinery, sheep and living expenses for twelve months have to be provided for. However, reasonable terms can often be obtained on the purchase of land and machinery, while assistance is also given by the Agricultural Bank on the security of land and improvements. Also share farming can be undertaken by an experienced man with small capital.

Experimental work of assistance to the progressive wheat farmer would include accurate yield tests in the chief districts, rate of seeding tests, rotational trials, various methods of ploughing, cultivating, and rolling, the testing of long and short fallow periods, fertilizer tests on light or impoverished soils, determination of the costs of production with modern methods in the chief areas, also continued work in the breeding and selection of improved types.

As wheat is only one of many important crops raised in Queensland, we cannot hope to finance such extensive wheat research work as is carried out in the Southern States, where wheat is the major crop, but nevertheless the Department of Agriculture in Queensland has been of considerable service to the growers in the matter of breeding and introducing improved varieties.

The Queensland wheat industry has not progressed as rapidly as that of the Southern States and Western Australia, owing to land in the wheat belt being also admirably suited to general farming, dairying and sheep raising. This is obviously not to be deplored, for our farmers can alter their cropping system to meet changing economic conditions. The absence of any necessity to use fertilizer except on certain lighter

soils is also a distinct advantage, although this is offset to a certain extent by the heavier working of the Downs soils.

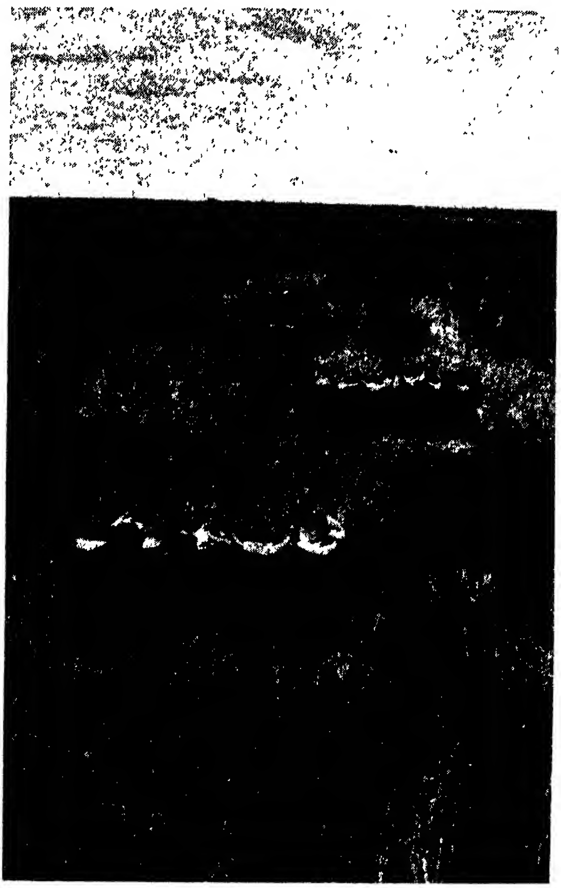


PLATE 132.—GRAIN READY FOR GRISTING.
In the Wake of an Auto-Header on a Darling Downs Farm.

Finally, the Queensland wheatgrower has had the benefit of organised marketing in recent years, which has greatly assisted in stabilising the industry, for despite any criticism of the Wheat Board's activities, the growers themselves remain in control, through their elected representatives, and can therefore direct the ultimate policy to be pursued.

SHIFTING FARM MACHINERY.

When it has to be done along metalled roads, wear and tear and shaking loose of bolts may be avoided if the travelling wheels are covered with old motor tyres. Cut the bead off before wrapping round the wheels, draw the edges together and fasten with fine wire, puncturing the holes with a bradawl. If the tyre is too large, cut a piece out and join neatly. A stripper working on stony ground will do smoother work shod in this way.

Fruitgrowing in North Queensland.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) has received the following report on fruitgrowing in North Queensland from the Director of Fruit Culture (Mr. H. Barnes) :—

THE usual fine weather period has been experienced during the last quarter of 1934. Growing conditions during the early part of the quarter were excellent, warm weather being well interspersed with showers. December, however, was excessively hot and dry, and orchards suffered in consequence.

Rainfall at Cairns during the period was 126 points during October, 512 during November, and 145 during December, the number of wet days being respectively 6, 14, and 6, a total fall for the quarter of 783 points as against 2,409 for the same period of 1933.

Districts included in this report are Daintree, Mossman, Port Douglas, Bartle Frere, Innisfail, Silkwood, Cardwell, Herberton, Ravenshoe, Kuranda, and Cairns.

The various fruit crops throughout the North appear to have been affected by the adverse climatic conditions of the earlier part of the year. Crops of practically all varieties of fruits are somewhat patchy even on orchards in the same localities.

Tropical and Sub-tropical Fruits.

Citrus throughout the North is showing a fairly light crop, except in a very few orchards where medium to good crops are showing. The blossoming was very light and very protracted, resulting in the crops on individual trees showing a wide range of growth, odd fruits being near maturity while the remainder vary right down to young fruit little more than just formed. As a general rule the trees have made good growth during the period, this being particularly the case with young trees.

Bananas showed considerable improvement in the condition of plants during the quarter. The fruit, however, has not shown a corresponding improvement.

Fresh plantings have been made in various parts of the district to supply local demand.

Sugar bananas, whilst frequently producing heavy bunches of good fruit, are practically all affected with Panama disease.

Pineapples.—Harvesting of this crop, which commenced in the Cairns district in late October, was practically concluded by the end of the year. In districts south of Cairns the season is slightly later, and harvesting was still in progress at the end of the quarter. The fruit produced in Cairns was chiefly of small size, and the introduction of fresh vigorous stock appears desirable.

The variety grown is almost exclusively Common Rough, this being most favoured in the local trade. The inclusion of small areas of Smooth Leaf variety would be well worth consideration of Cairns growers to extend the season.

Papaws have been in fair supply and chiefly of fair quality. The demand has been good.

Mangoes carried a very fair crop in the Cairns district, this being occasioned by dry weather during the blossoming period. The crop in the Cardwell district, on the other hand, was light, rain falling there while the trees were blossoming.

Throughout the North the general quality of mangoes grown is not good, the bulk of the trees being ordinary seedling types. Only a few good varieties are to be found. Although top-working or budding of mango trees is not quite so easy as the working over of citrus trees, it will be necessary to so treat the many poor type trees if any market demand is to be established for this fruit. Districts such as Cardwell and Rollingstone are well adapted to mango-growing, and a few trees of selected varieties only would be a good commercial proposition to local landholders.

Deciduous Fruits and Grapes.

The plum crop on the Tablelands was this season a light one. The chief variety grown is a small early-ripening one known locally as "Precious," but bearing a close resemblance to "Wright's Early." Other varieties grown are "Satsuma," "Kelsey," "Blood," and odd "Shiro" and Wickson."

The quality of fruit produced is good, but unfortunately considerable loss is caused by fruit fly.

Plum trees, and, in fact, most deciduous varieties of fruits grown on the Tablelands, are raised from cuttings, which strike with remarkable ease and produce good trees.

Pears of "Keiffers" and "China" varieties are cropping fairly well.

The grape crop is only fair this season. "Goethe," "Isabella," and "Ferdinand de Lessop" varieties are showing the most promising results.

Persimmons are again carrying a good crop this year. The Tableland conditions appear to be well suited to the growth of this fruit.

Nuts.

Queensland nuts were very severely tested by the hot dry conditions of the latter part of the quarter. In very many cases along the coastal area the leaves were badly scorched and some trees were completely killed. Protection of young trees from the direct rays of the sun appears to be almost imperative with this nut.

Litchis.—The growing of these trees is slowly expanding. Unfortunately, young trees are not obtainable locally, but have to be imported from China, and this retards the expansion of their cultivation.

Tung Oil.—Fresh plantings have been made in various parts of the North, the area now under these trees being approximately 80 acres. The crop during the year was rather lighter than that obtained in the previous season.

Other Fruits and Vegetables.

The watermelon crop during the quarter was a good one, melons of very fine quality being produced during the early part of the season. The later-ripened fruit, however, was rather deficient in flavour. One grower in the Tully area reports having cleared £180 from a melon crop this season.

Small patches of strawberries on both the coast and the Tablelands have produced well.

Tomatoes gave promise of good returns, but a week of wet weather during the early part of the quarter caused an invasion of blight and black spot, which curtailed the crop. The Kennedy district (the largest tomato-producing area north of Townsville) shipped only about 4,000 cases on this account.

Beans and cabbages were produced in fair quantities on the Tablelands during the quarter and found a ready sale. Bean fly is, however, a serious pest.

FARMYARD MANURE—ESTIMATED VALUE TO THE FARMER.

Although there is no standard composition for dung, most farmers agree that the value of the heap depends largely on the amount of urine absorbed in it. Out of 100 parts nitrogen fed to a fattening bullock, 4 parts are retained in the system: 96 are excreted, and of these only 22 are in the solid excreta, while 74 parts are in the urine.

In all stages of its history dung has been susceptible to loss, the loss falling most heavily on its constituents of highest manurial value. The two main sources of loss are volatilisation and liquid drainage from the byre or manure heap. Nitrogen in the urine in the form of urea being readily turned into carbonate of ammonia, this change means escape through the atmosphere, a circumstances which can be readily detected in stables. The better the dung is consolidated the less is the loss through volatilisation. Exposure of the dung heap to rain and drainage from the roofs of buildings are other sources of wastage of nitrogen and potash, and likewise, when the dung heap is not compressed, the process of combustion—although such manure gave a false increase in phosphoric acid—is another source of loss. Covered courts and covered feeding yards are the most perfect methods of keeping dung. By such methods the valuable constituents are far better preserved than in open heaps with the manure thrown on in haphazard manner, and where it lies exposed to air, rain, and frequently the water from the roofs of buildings.

As a comparison between the two systems, experiments have shown that under the latter half the nitrogen and half the potash can be lost, while any gain in phosphoric acid is more lost through shrinkage in weight. As regards the non-volatile constituents, the highest percentages are found in dung of uniform quality. There is no greater variation in these as regards the quality of straw consumed by stock, but dung in process of rotting tends to become poorer in non-volatile constituents. The difference between rich and poor dung, however, lies in the retaining or allowing to escape the volatile soluble materials.

In an effort to estimate the cash value of farmyard manure, Professor Hendrick, of the Aberdeen and North Scotland Agricultural College, points out that comparison of the excreta and urine of different farm animals shows how much more valuable urine is in nitrogen and potash, whereas phosphoric acid is almost entirely retained in the dung. The small percentage of nitrogen present is insoluble or slow acting, resembling the nitrogen in horn, shoddy, or wool, whereas nitrogen in urine is quite as valuable as nitrogen in sulphate of ammonia. Therefore, a higher value must be placed upon it, and similarly on the potash contained in the urine. Again, the influence of the food on the quantity and quality of dung and urine has to be taken into account. If an animal gets more water than is required, the excess is excreted in the form of diluted urine. Experiments have proved that a 9 cwt. bullock getting 119 lb. turnips and 9½ lb. straw daily, excreted 58 lb. urine containing .22 per cent. nitrogen, as contrasted with 15¼ lb. urine containing .58 per cent. nitrogen when the animals received half that quantity of turnips, 13 lb. straw, and 3 lb. linseed cake. Turnips fed in large quantities tend to increase the urine and reduce its quality. In regard to solids excreted, by far the larger percentage comes from the amount of straw consumed, experiments showing that from 6 lb. to 8 lb. straw supplied as much as 30 lb. or 40 lb. fæces, as excreted by a dairy cow.

Professor Hendrick estimated that 1 ton of good average quality dung is worth 8s. to 9s. per ton, while dung of inferior quality may be valued at 5s. to 6s. per ton.

Farm Horse Breeding.

From a paper read by Mr. M. F. O'Brien, of Kyancutta, at a conference of the Eyre's Peninsula Branch of the Agricultural Bureau of South Australia.

At the present time well-bred horses are bringing good prices, due, no doubt, to the curtailment of breeding a few years ago when tractors were taking the place of horses on so many farms. A large number of farmers who were previously using tractors have now turned their attention to breeding horses, as breeding is the most economical way of obtaining a really good team. Most farmers are breeding one or two foals each year to replace aged horses on their farms, while others are breeding more than they require, and these surplus horses will be placed on the market during the next few years, with the result that prices will not be maintained at their present level. It will therefore be necessary for those who are breeding horses for sale to pay special attention to the type of horse that they are breeding. A good type of farm horse will always command a fair price, while inferior and medium types will be hard to dispose of.

After selecting the best mares on the farm, be very careful in the choice of a sire. Do not breed from a horse not true to type. Many farmers breed from any sort of a colt because they can turn him in the paddock with the mares and save the trouble of looking after an entire. This method is false economy, for it costs no more to rear a good type of foal than a half-breed. It may be said that the half-breed will work as well as a good horse, but he will never look as well in the team, and it should be every farmer's desire to have as good a team as possible. Again, the medium horse will never command near the price that a good type horse will in the sale ring.

The farmer who does not keep an entire, and who patronises a travelling horse should, if he has a choice, look well into the merits of each horse travelling in his district. If you have a thick set, nuggety mare always choose a good, tall horse, and vice versa, but remember he must be true to type, and a proved foal-getter. I prefer the Clydesdale type of horse for farm work. They usually prove to be good workers, combining strength with pace, and are exceptionally good tempered, while the mares are always good mothers.

When the foal is born catch it and paint the navel with iodine, repeating the treatment daily for three or four days or until the navel has dried up; this will often prevent navel ill. Also, see that the mare is normal and has plenty of milk. Give her a hot bran mash after foaling, continue to give liberal quantities of bran and crushed oats if she does not appear to have sufficient milk for the foal, and allow her to graze at will in a small paddock of greenfeed. Should the foal refuse or be unable to suckle it may be necessary to give an enema, but before doing so try working a little olive oil into the anus with a finger. This often gives relief to the foal and saves straining.

To wean a foal I prefer a small paddock of greenfeed. A small quantity of chaff and oats may be made available, the foal having free access to plenty of clean water. The mare must not be forgotten, and the day the foal is weaned the mother should be fed on chaff (no oats) containing 1 lb. of Epsom salts, and be given only small quantities of water for a day or two. It is best to keep the mare working as this will help to dry her off. Should the udder become swollen and hard rub first with olive oil, then with vinegar (three parts) and olive oil (one part), and if not working give plenty of exercise. Breed foals early, say, in July or August. At this time of the year there is usually plenty of greenfeed for the mares, and the foals when older will shed their coats earlier, and usually look better than a late foal. To breed early foals and wean them at, say, six months, it is essential that a small paddock of lucerne be available.

Colt foals should be castrated in spring at about 14 months. It is best to obtain the services of a veterinary surgeon, if one is available, but the operation may be successfully performed by any competent stockman. The three main points to remember are:—First, see that the emasculators have been sterilised; second, rope the colt securely and throw him on a patch of green grass—not in the stable or yard where there is any sign of stable manure; and third, use plenty of disinfectant.

The colt or filly can be broken in at two years by giving it a few short yokes in the cultivator or harrows when working back the fallow. This should harden the shoulders, and if worked during the harvest they will not be so likely to scald. Do not work a two-year-old more than four or five hours a day in a stripper or harvester if the weather is very hot.

It is advisable to put them in a wagon when wheat carting to teach them to pull, but do not overload, and do not expect a horse to do a full day's work or pull his full share of a load until he is at least three years old. If you treat a horse well while it is young you will be amply repaid by the extra service it will give when it is older.

PRODUCTION RECORDING.

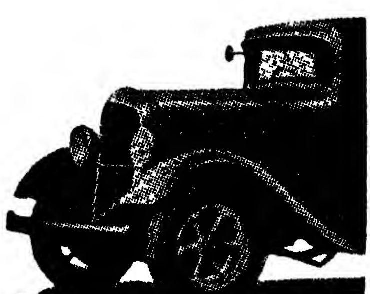
List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled for the month of January, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Red Roan 4th of Blacklands	A. Pickels, Wondai	11,747·15	410·22	Premier of Hillview
Lady May 2nd of Merlin (269 days)	A. Pickels, Wondai	11,775·11	384·973	Limelight of Greyleigh
Charm III. of Bri Bri	A. E. Vohland, Aubigny	8,366·95	383 661	Gay Boy of Tryonne Villa
Duchess 2nd of Alvaglen	G. H. Knowles, Nanango	10,747·35	381·168	Cashier of Greyleigh
Eileen of Bellwood	S. J. Currant, Gunalda	8,720 05	370·982	Triumph of Oakvale
	JUNIOR, 4 YEARS (UNDER 4½ YEARS). STANDARD 310 LB.			
Evelyn of Alfavale	W. H. Thompson, Nanango	15,239·8	660·362	Reward of Fairfield
Charm II. of Blacklands	A. M. Johnson, Gracemere	10,274·7	448·377	Red Prince of Blacklands
Glenore Gentle (269 days)	A. M. Johnson, Gracemere	9,330·45	376·291	Starlight of Sherwood
Blacklands Miss Minnie 2nd	A. M. Johnson, Gracemere	9,207·75	375·387	Red Prince of Blacklands
Rosenthal Pendant 5th	R. V. Littleton, Crow's Nest	8,643·7	346·472	Rosenthal Surplus
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Model 3rd of Alfavale (271 days)	W. H. Thompson, Nanango	10,964·47	501·438	Reward of Fairfield
Navillus Olive	C. O'Sullivan, East Greenmount	10,727 99	420·806	Midgets Sheik of Westbrook
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Navillus Violet	C. O'Sullivan, East Greenmount	7,925·75	322·864	Sunrise III. of Rosenthal
Rhodesview Daly 5th	W. Gierke and Sons, Helidon	7,923·86	298·357	Birdwood of Rhodesview

	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 270 LB.			
Honey 8th of Sunnyside (365 days)	P. Moore, Wooroolin	10,415·35	414·776	Bruce of Avone
Ashdale Duchess 4th (271 days)	A. Frank, Boonah	9,236·9	375·401	Diamond of Greyleigh
Foremost 5th of Blacklands (268 days)	A. Pickels, Wondai	7,183·15	324·438	Fussy's Monarch of Hillview
Home Hill Alice (269 days)	A. O. Althouse, Cloyna	7,810 44	298·528	Duchess Jellicoe of Fairfield
Rhodesview Tiny 6th	W. Gierke and Sons, Helidon	7,529·47	289·982	Colonel Rose of Rosenthal
Glenroy Jemima	W. F. Kajewski, Glencoe	7,893·77	287·465	Glenroy Kitchener
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Navillus Vision	C. O'Sullivan, East Greenmount	8,427 78	333·981	Midgets Sheik of Westbrook
Navillus Daisy II.	E. W. Jackson, Nobby	8,135·81	306·914	Midgets Sheik of Westbrook
Rhodesview Nancy 10th	W. Gierke and Sons, Helidon	5,899 62	262·878	Rhodesview Red Knight
Arley Speck 3rd	B. J. Nothling, Maleny	6,560·25	259 847	Greyleigh Syntax
Montcairn Charmaine	A. E. Vohland, Aubigny	5,888·45	243·513	Dandy of Wilga Vale
	FRIESIAN.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Ryfield Pansy 3rd (265 days)	P. Wason, Kingaroy	12,964·25	453·297	Bell De Koh Ongam (Imp.)
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Flagstone Pansy 2nd	P. Wason, Kingaroy	8,514 35	302 85	Mooroombin Colanthea
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Trinity Skylight	F. P. Fowler and Sons, Biggenden	10,198·75	604·288	Lord Ettrey of Banyule
Lyndhurst Marella	J. B. Keys, Gowrie Little Plains	9,753·79	567 15	Mercedes Noble King of Ogilvie
Bellefaire Claire De Lune	J. B. Keys, Gowrie Little Plains	9.971·49	544 893	Masterpiece Yeribie of Bruce Vale
Fauvic Rejoice	H. Cochrane, Kin Kin	6,823 1	419 396	Yingara King
Kelvinside Alice Arabella	J. and R. Williams, Crawford	7,542·5	407 631	Benedictines Perfection of Kelvinside
Trecarne Rosette	T. A. Petherick, Lockyer	6,882·6	355 773	Carnation Royal Scot
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Blossom of Linwood	F. W. Kath, Ellesmere	7,453·85	373 51	Aerofoil of Banyule
College Peggy	Queensland Agricultural High School and College, Gatton	6,066 45	286·192	Burnside Renown

Production Recording—*continued*.

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY—continued.			
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Glenview Sultan's Majesty	F. P. Fowler and Sons, Biggenden	7,579 05	397 567	Trinity Officer
Glenview Successor	F. P. Fowler and Sons, Biggenden	6,150·75	364 302	Trinity Officer
Glenview Miss Scott	F. P. Fowler and Sons. Biggenden	5,923 0	352 126	Trinity Officer
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Woodside Xenia	J. and R. Williams, Crawford	5,755 5	323 028	Rochettes Volunteer
Jesters Pet of Glenmore	J. and R. Williams, Crawford	5,062 95	273 136	Wheatlands Jester
Bellgarth Maderia 2nd	D. R. Hutton, Cunningham	4,536·06	253 802	Bellefaire's Blondes Bellringer
Glenmah Victors Duchess	F. A. Maher, Indooroopilly	5,543·9	244 503	Retfords Victors Noble
Heather of Wattleview	E. G. Groves, Kandanga	4,226 1	237 753	Prince Royal of Wattleview



Crown Land for Selection.

DAIRYING AND MIXED FARMING COUNTRY.

INNISFAIL DISTRICT.

On 3rd April next, thirty-two portion in the Clump Point district are to be made available for perpetual lease selection in areas ranging from 174 to 390 acres, and at capital values ranging from 16s. 8d. to £1 12s. 6d. per acre. Situated from 2 to 8 miles from El Arish Railway Station, which is 4 miles from Silkwood Butter Factory, the land comprises mostly tropical scrub with fair to good soils, interspersed with patches of forest. Permanently watered throughout.

On 2nd May next, fifty-three portions in the East Palmerston district are also to be made available in areas from 152 to 258 acres, and at capital values ranging from £1 10s. to £3 per acre. Situated from 16 to 22 miles from Innisfail, and from 1 to 7 miles from Nerada Railway Station. The nearest butter factory is at Silkwood, which is only 16 miles by rail from Innisfail. All dense tropical scrub with rich volcanic soil, permanently watered by numerous creeks and watercourses.

Applicants for these lands will be required to show that they have dairy farm experience and capital. Approved applicants wishing to inspect will be granted half-fare concession tickets on Queensland railways. Inspection fares paid by successful applicants will be refunded after selection.

Applications will be received at Land Office, Innisfail, and Lands Department, Brisbane, up to 3rd April for Clump Point lands, and 2nd May for East Palmerston lands.

Plans and particulars obtainable at Lands Department, Brisbane; Land Office, Innisfail; and Tourist Bureaux, Brisbane, Sydney, and Melbourne.

GRAZING HOMESTEAD SELECTION.

HUGHENDEN DISTRICT.

109,620 ACRES OF SHEEP LAND.

PARTS OF MAXWELTON, CAMBRIDGE DOWNS, AND RICHMOND DOWNS RESUMPTIONS.

The undermentioned lands will be open for Grazing Homestead Selection at the Court House, Richmond, on the 11th April, 1935:—

Portions 6 and 9, parish of Anstey, comprising the southern part of Maxwelton holding, situated about 20 miles south of Maxwelton Railway Station, areas 26,304 acres and 26,967 acres. Annual rents, 2¼d. per acre and 2d. per acre respectively for the first seven years.

Portion 8, parish of Kenmac, comprising the eastern part of Cambridge Downs holding, situated about 12 miles north of Richmond, area 23,409 acres. Annual rent, 2¾d. per acre for the first seven years.

Portion 1, parish of Doncaster, comprising the north-western part of Richmond Downs holding, situated about 28 miles north-east of Richmond. Area, 32,940 acres. Annual rent, 1¾d. per acre for the first seven years.

The term of lease in each case is twenty-eight years.

The provisional valuation of the improvements on the portions ranges from £834 to £971.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

The whole of the portions comprise open undulating downs well grassed in normal seasons with Mitchell, Flinders, blue, and barley grasses. Each portion is watered by a bore and drains.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, and the Land Agents, Hughenden and Richmond, and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

THE FIREBRAND.

The commonest mistake in putting on a firebrand is making it too deep. For horses it is best to rub the hair down smoothly with olive oil or castor oil—fat will do, though not so well. Then apply the brand as hot as possible, just sufficiently to feel it bite the skin. For cattle a little firmer pressure is desirable, but it is well to remember that the better bred the animal the less pressure required.

CARE OF THE SAW.

Saws are the hardest tools for the amateur to keep in good order. Leave two or three of the teeth nearest the handle of a new saw always untouched; they never come into actual use, and if left intact provide a certain guide as to how the other teeth should be kept.

WATERPROOFING BOOTS.

One pint linseed oil, ¼ pint oil of turpentine, ¼ lb. beeswax, ¼ lb. pitch. Melt ingredients by standing tin container in boiling water away from a fire, renewing hot water till all are blended. The vapour is inflammable. When dissolved pour the liquid into a tin to set. When required for use melt a small quantity and rub well into the soles of the shoes.

Or: Melt in a tin over a low flame 1 pint boiled linseed oil, ½ lb. mutton suet, 6 oz. clean beeswax, and 4 oz. resin. See that boots are dry and clean, and give a plentiful dressing; it must be put on warm with a soft brush. The leather will become quite pliant and resist all moisture.

Or: Rub a lump of wax on the boots or shoes till they become a grey colour, then heat a piece of old linen or soft calico in the oven and smooth over with the hot rag till the leather has absorbed the wax. Allow the shoes to cool, then give a good brushing and apply a good boot polish.

IDENTIFYING THE POISON BOTTLE.

A sure way to avoid mistaking a poison bottle for another is to push two ordinary pins crossways through the top part of the cork at right angles, with the points projecting. That identifies the bottle even in the dark.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Shell Flower. Bindweed.

J.L.E. (Woodhill, Beaudesert Line)—

1. The plant with the green, bell-shaped flower is the Shell Flower or Molucca Balm (*Molucella lævis*), a native of Western Europe commonly cultivated in gardens as a curiosity. On parts of the Darling Downs it has become quite naturalised, but nowhere, we should say, has established itself as a dangerous weed.
2. The plant with underground runners bore neither flowers nor seeds, but it is evidently the Bindweed (*Convolvulus arvensis*). This weed has become increasingly common on the Darling Downs during the last four or five years, but this is the first case we have had of its growing outside that district. It is quite common in some of the Southern States. It is one of the worst weed pests so far introduced owing to its habit of producing a large number of underground running roots. Any part of these roots which is cut by a fork or plough forms a new plant. If the patch is only a small one it is probably better not to disturb the ground but to cut the young shoots and green portions down as they appear. If this is done regularly for a time the underground parts will become exhausted. A weak arsenical solution poured into the patch could be tried, and with this type of plant we think it is better, generally speaking, to use a large quantity of weak solution than a small quantity of strong. If it is decided to fork the plants out, care should be taken that the underground roots are not carried about and dropped here and there. As with Nut Grass, in small patches where it can be applied a covering of dry waste salt at the rate of ½ to 1 lb. per square foot has been found to be effective. This method is only applicable in large fields where a patch of barren ground does not matter, because the salt would render the land barren for a season or two.

Red Clover.

J.M. (Brisbane)—

The specimens represent the Red Clover, *Trifolium pratense*, a perennial species that seems to have come into favour in Queensland during the past few years, as I have seen and heard of several good plants of it. Under Queensland conditions it would probably be a short-lived perennial, lasting two, or perhaps three years at the most, although grazing might prolong the life of the plant. So far as we have observed, it does not seem altogether suitable for pasture conditions here, but is preferable for growing in small areas, either by itself or mixed with winter grasses for periodical grazing off. When grazed by itself it is very apt to cause bloat, and for this reason the mixing of it with grasses is to be preferred.

A Species of Yam.

F.McD. (Toowoomba)—

It is sometimes difficult to name plants from single leaves only, especially without any reference to the habit of growth, but the one you sent is a species of *Dioscorea*, probably *D. bulbifera, Var. suavoir*, a species of yam known as the Otaheite Potato. It is grown in Queensland purely as an ornamental vine. It dies down in the winter months, but bulbs or bulbils are borne in the axils of the leaves, and young plants grow from these. The question is often asked whether these tubers are edible or not, and we asked a leading authority on yams about the question once, and he told us that it was very difficult to say whether they were or not. As a general rule, if they were cut and went brown quickly, it was a sign that they were unfit for human consumption, and if in doubt the safest way was to cook and taste discreetly.

Chalta Tree. Osage Orange.

S.E.S. (Cairns)—

1. *Dillenia indica,* the Chalta Tree. A small, very handsome tree, with large white flowers, followed by large globular fruits. It is a native of India, and in that country the fruits are said to be used in curries and chutneys. Though I have seen the tree in cultivation in different parts of Queensland, I have never known anybody here use the fruit.

2. *Maclura pomifera,* Osage Orange. A native of North America, and largely planted in the Middle-West of the United States for hedges. It is grown in some parts of Australia, but on the whole, so far as I have observed, prefers a rather drier and colder climate to that of the Atherton Tableland. The fruits, though perhaps attractive looking, are inedible, and the plant does not belong to the citrus family, but to the Moracae family.

Plants Identified.

F.C.C. (Pittsworth)—

1. *Hibiscus trionum,* the Bladder Ketmia. A very common weed in parts of the Darling Downs and Central Queensland. Very common in the pastures. Belongs to a family not known to possess any poisonous qualities. This is probably the gooseberry-like plant mentioned by you.

2. *Cucumis* sp., probably *Cucumis myriocarpus,* the Gooseberry Cucumber, or Paddy Melon. The juicy pulp of the fruit is poisonous, due to a resinous body—myriocarpin. Bicarbonate of soda is the recognised antidote for cucumis poisoning.

3. *Neptunia gracilis,* the Sensitive Plant. A very common pasture herb and good fodder, and not known to be poisonous or harmful in any way.

4. *Atriplex semibaccata,* Salt Weed or Creeping Salt Bush. Same remarks apply as to No. 3.

5. *Anagallis arvensis,* the Pimpernel. A poisonous weed very common in cultivated areas in Queensland. Rarely eaten by stock in sufficient quantity to cause trouble, but some years ago we received seeds of this plant which have been taken in great quantity from the stomach of a cow. There are two forms in Queensland—one with red and the other with blue flowers. The properties are the same.

6. *Euphorbia drummondii,* Caustic creeper. A very common weed in parts of Queensland, and generally regarded as poisonous. Experienced stockowners always give the chief symptom as a marked swelling of the head and neck. When pierced this swelling exudes an amber-coloured fluid, and the life of the animal may be saved. Travelling stock seem to be most affected by the weed.

7. No flowers or seeds, but seems to be *Lithospermum arvense,* the Corn Gromwell, a common European weed abundant on farms in the Darling Downs. It is not known to possess any poisonous or harmful properties.

In forwarding specimens for identification and report, it is always advisable to number each specimen and retain a duplicate similarly numbered, or notes corresponding to your numbers, when names and reports can be returned accordingly.

A Beautiful Native Tree (*Ganophyllum falcatum*).

D. (Carmila, N. C. Line)—

Your specimen is *Ganophyllum falcatum,* a native of coastal Queensland, extending through New Guinea and the Malayan Archipelago to the Philippine Islands. We have not heard a local name given to it here, although it is moderately common in some parts of the Queensland coast, including some of the Islands of the Whitsunday Passage. In the Philippines it is known as *Arangen,* and, according to Dr. W. H. Brown, Chief of the Bureau of Science, Manila, the seeds of this species yield a solid fat used by some of the natives of the Philippines for illumination. The seeds are crushed and then boiled, when the oil floats on the surface. The bark, when shredded and soaked in water, yields a froth, and is said to be used in some places on this account as a substitute for soap. The berries are not known to be poisonous in any way, and we should say the tree was well worth planting as an ornamental one. The cultivation of some of these beautiful native trees is certainly to be encouraged.

Mitchell Grass.

H.M.R. (Reedley, Fresno County, California, U.S.A.)—

In reply I might state that there are four distinct kinds of Mitchell Grass in Queensland. They all belong to the genus *Astrebla.* The commonest, and, I think, the most valuable, is *Astreble lappacea* (synonym), *Astrebla triticoides*). Seed of this, and of another one, *Astrebla pectinata*, can usually be obtained from Messrs. A. Yates and Co., Ltd., Sussex street, Sydney, at 7s. 6d. per pound. The seed is very light, and I should think a pound would be quite sufficient for trial purposes for you. In your country it would probably be best sown about April, when it should ripen in August or September. The grass is not usually sown, but occurs annually in the pasture, and is mostly grazed. Sometimes it is made into hay, and is excellent for the purpose.

Asthma Plant.

G.R.P. (Brisbane)—

The specimen represents *Euphorbia pilulifera*, the Asthma Plant, a very common weed in Queensland and widely spread over the tropical and sub-tropical regions of the world. It certainly in many cases gives relief from asthma, and is not known to possess any poisonous or harmful properties. The usual method of preparation is to dry the harb in a shed or other shady place, turning it over occasionally so that it does not mildew, and making in the form of ordinary tea, about the same strength, and a wineglassful is a dose. The usual method, I think, is to let it get cold before drinking.

A Species of Native Cherry. Hoya.

S. (Townsville)—

The specimen of fruit is *Eugenia Tierneyana*, a special of Native Cherry or Lilly-pilly, common along creeks and rivers in North Queensland. Most of the Native Cherries or Lilly-pillies can be used for jam making, although we have not known anybody use the present one. When we do not know definitely the qualities of the fruit, we rather hesitate to recommend them for use, owing to one member of the family, the Finger Cherry, being so very poisonous, causing, as you know, permanent blindness, to those people who eat it. The wax-like leaf is *Hoya Nicholsoniæ*, the North Queensland Hoya or Wax Flower, a common climber in some of the scrubs or rain forests of North Queensland, well worthy of cultivation, and easily propagated from cuttings.

Lantana.

P.J.W. (Samarai, Papua)—

The specimens represent a form of *Lantana Camara*, a common "Lantana" that is such a common weed pest in Queensland. The specimens were very withered when they reached me, but seem to be of the dark-red flowering forms, and these, on the whole, are not such a pest as the common form, in which the flowers come out yellow and turn to pink or lilac. Since the introduction of the Lantana Seed Fly into Queensland, the spread of Lantana certainly, we think, does seem on the decrease, although, of course, it is still a very serious pest in many places.

Coffee Senna.

W.W. (Proserpine)—

The specimen represents *Cassia occidentalis*, the Caffee Senna, a native of tropical America, now common as naturalised weeds in most tropical and sub-tropical countries. It is very common in coastal Queensland. As it and another member of the genus *Cassia* have been accused of poisoning stock from time to time in Queensland, experiments were carried out with it at the Animal Health Station, Yeerongpilly, some years ago, and it was shown to purge cattle, but to have no other ill effects. This is what one would expect, as the plant belongs to the same genus as the shrubs which produce the senna leaves of commerce. The name "Coffee Senna' refers to the fact that the seeds have been reported to be used as a substitute or adulteration for ordinary coffee.

General Notes.

Staff Changes and Appointments.

Mr. G. W. Ashford, of Gympie, has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, and will be stationed at the Murarrie Bacon Factory.

Mr. A. R. Betts, Inspector of Stock, has been transferred from Murarrie to Upper Pilton.

The following have been appointed canegrowers' representatives on the undermentioned local sugar cane prices boards:—

Messrs. W. G. Merrill and F. W. Valentine, Cattle Creek Local Board; W. D. Davies and W. C. Ah Shay, Goondi Local Board; and T. F. Ross, North Eton Local Board.

Mr. C. Blake, Wamuran, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Mr. L. C. Vallence, Assistant to Analyst, has been appointed Analyst, Government Chemical Laboratory, Department of Agriculture and Stock.

Mr. J. M. Martin, of Kangaroo Point, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act. A similar appointment has been given to the Forest Ranger at Cardwell, Mr. G. S. R. Gentry. Honorary Rangers under the Animals and Birds Acts have been appointed in the Bundaberg district,—namely Messrs. J. C. Twyford (Avoca), J. Dittmann (Branyan), and C. G. H. A. Bock (Branyan road, Bundaberg).

Mr. J. W. Moy, Temporary Inspector, has been appointed an Inspector on probation under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts.

Plywood and Veneer Levy

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts, empowering the Plywood and Veneer Board to make a levy on all pine plywood and veneer delivered between the 23rd February, and the 2nd May, 1935, in pursuance of an order allocated by the Plywood and Veneer Board. The levy shall be used to provide for the administrative expenses of the Plywood and Veneer Board, and shall be at the following rates:—

(*a*) On plywood three-sixteenths of an inch or less in thickness and on veneer three-sixteenths of an inch in thickness at the rate of 2½d. per 100 feet face measurement.

(*b*) On plywood or veneer of a greater thickness than three-sixteenths of an inch and on veneer of a thickness less than three-sixteenths of an inch at the rate per 100 feet face measurement which bears the same proportion to 2½d. as the thickness of the plywood or veneer bears to three-sixteenths of an inch.

Dairy Products Stabilisation Act.

Executive approval has been given to the issue of an Order in Council further amending the Dairy Products Stabilisation Act, and a Regulation to provide for the expenses of members of the Dairy Products Stabilisation Board.

The amendments to the Act include the alteration of the definition of "quota." The definition, before amendment, was the proportion of dairy products manufactured during a stated period in the State that a manufacturer is permitted to sell in the course of his intrastate trade in the State. The new definition provides that "quota" shall be the quantity of dairy products manufactured in the State which a manufacturer is permitted to sell within any stated period of time in the course of his intrastate trade in the State.

Butter, Cheese, and Plywood and Veneer Boards Extended.

Orders in Council have been issued giving notice of intention to extend the operations of the Butter, Cheese, and Plywood and Veneer Boards.

It is proposed to extend the Butter and Cheese Boards for the period from 8th February, 1935, to 30th June, 1935, and the Plywood and Veneer Board from 3rd May, 1935, to 2nd May, 1936. In each case petitions for a ballot on the question of whether or not such Boards should be continued for the periods mentioned may be lodged at the Department of Agriculture and Stock on or before 18th February next.

Poole Island a Sanctuary.

Poole Island, in Port Denison, Bowen, has been declared a sanctuary under the Animals and Birds Acts, and it will be an offence to take or kill any animal or bird on such island.

Plywood and Veneer Board's Levy.

Regulations which have been issued under the Primary Producers' Organisation and Marketing Acts empower the Plywood and Veneer Board to make a levy on pine plywood at the rate of 3d. per hundred feet face measurement, such levy to be used in establishing and maintaining a fund for the purpose of subsidising manufacturers for plywood despatched outside the Commonwealth. The levy will remain in force from the 5th February, 1935, under the expiration of the present Board on the 2nd May next, and the amount of such levy shall be paid weekly to the Board on all deliveries made by manufacturers as shown by the respective weekly returns submitted to the Board.

Provision is made in the Regulations for a ballot to be taken on the question of whether or not the levy shall be made if four or more "growers" petition the Minister for Agriculture to that effect before the 4th February, 1935. Persons eligible to vote are those who own plywood and veneer plant and have produced plywood and veneer for sale.

New Bags for Imported Potatoes.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) has announced that it had been decided, as from the 1st February, to enforce the regulation under the Diseases in Plants Acts providing for the use of new bags for potatoes imported from other States.

"His attention had recently been drawn," added the Minister, "to the state of the bags being used, which, in many instances, were in a deplorable condition." All the other States insisted on the use of new bags for imported potatoes, and though a similar regulation had previously been gazetted in Queensland it had never before been strictly enforced.

Live Virus Cultures—Transmission by Post.

The Postmaster-General's Department advises that it is necessary for the following conditions to be complied with in connection with the transmission by post of live virus vaccine:—

(1) Live virus vaccine must be enclosed in a thick glass container hermetically sealed. The container must be surrounded with an absorbent substance in sufficient quantity to protect it from breakage and to absorb all the liquid in the event of it being broken. The container and its protective covering must be securely packed in another container of metal, wood, strong corrugated paper or other suitable material. The outside cover must bear the name and address of the sender and an endorsement indicating the nature of the contents of the package.

(2) The distribution and use of live virus cultures are subject to the provisions of the State laws, and the responsibility for observance of those laws lies with the persons concerned in such distribution and use.

Bullamon Plains a Sanctuary.

The property of Mr. E. B. Cameron, at Thallon, known as Bullamon Plains, consisting of portion 80, parish of Bullamon, and portions 17 and 18, parish of Gerar, has been declared a sanctuary under and for the purposes of the Animals and Birds Acts, and Mr. Cameron has been appointed an Honorary Ranger under these Acts to ensure the protection of the native animal and bird life thereon.

"A.C.F." Granite Fertilizer—Error Corrected.

It is regretted that an error has occurred in the published analysis appearing in the 1934 Annual Report of the Department of Agriculture and Stock relating to "A.C.F. Granite Fertilizer."

The correct figures are as follows:—

	Guarantee. Per cent.	Found. Per cent.
Nitrogen, as ammonium sulphate	4	4.1
Phosphoric acid, water-soluble	12	12.0
Potash, as potassium sulphate	10	10.2

From the above it will be observed that the fertilizer in question is in accordance with the guarantee.

Rural Topics.

Horse-shoeing—Points Affecting the Animal's Welfare.

The increase which was taking place in the use of horses made it desirable to direct attention to certain points which, although well known to horsemen before the trend from animal to mechanical locomotion, were now in danger of being forgotten, observed the Chief Veterinary Surgeon of the New South Wales Department of Agriculture in a recent wireless address. On the observance of these points depended the welfare of the horse and very frequently the safety of the rider.

The shoeing of horses in order to protect their feet against damage when working on hard roads was a practice of great antiquity, but it was not until well on in the nineteenth century that it was reduced to really sound principles based on the conservation of the horse's foot and the prevention of injury. During the eighteenth century, an essentially artificial age, there had come into use certain practices—such as paring out the sole of the horse's foot until it was so thin that it could be made to bend on the pressure of the fingers, cutting away of the frog, and rasping of the whole outside of the wall to make the foot appear pretty, which were quite contrary to the design of the animal's anatomy. Indeed, the inculcation of proper methods had not been so much a question of seeing that things were done but that things were left alone.

It was well to remember in dealing with the foot that whilst the outside was a hard horny case, it contained very sensitive structures, and that if bruising or damage to these soft structures occurred, the results were far more serious than would be the case if these sensitive tissues were not enclosed in the hard horny case which was the hoof. In the case of an injury to soft tissues on other parts of the body, there was room for inflammatory reaction to take place, for swelling to occur, for fluid to be poured out around the injured part without subjecting the tissues to very severe pressure; but if any of these changes took place in the soft structures enclosed in the hoof, there was no room for expansion, the pressure was very severe indeed, caused considerable pain and naturally was accompanied by lameness.

The hoof, therefore, required to be left as far as possible in its natural state. The frog should not be mutilated, the bars must be left as strong as possible, the sole should be no more touched than was necessary to remove loose flakes of horn, and the wall should be left intact, no rasping being allowed above the clinches. It was, of course, often necessary to rasp the lower part of the foot in order to shape the hoof, but even this should be reduced to a minimum. A foot so treated would, unless disease was present, have a thick strong wall, which would not be unduly damaged by the nails, and would have a large and healthy frog capable of bearing concussion without injury to the animal's legs and strong enough to keep the heels open. The sole would be tough and would act as a guard against bruising or other injury.

The surface which was to bear the shoe should be flat and even and the shoe surface which was to meet this wall surface should also be flat and even. If either the under surface of the wall or the shoe was concave where they met in apposition, then pressure would not be evenly distributed over the wall and that portion of the wall which was receiving pressure would be liable to break away from the rest.

What was known as "springing the heels" was often indulged in and in this case, while lowering the wall of the heel by having a flat surface on the shoe, a space was left between the shoe and the hoof at the heels. When the horse put his foot to the ground pressure caused this space to be obliterated, but that only followed because an undue strain was placed on the wall. If the wall was to be maintained as strong as possible it should meet the shoe evenly when at rest, and no space should be possible between the shoe and the bare surface of the foot.

Shoes if left on the hoof too long were very apt to cause damage, and it was sometimes thought that if a horse had only been carrying out light work on easy roads and the shoe was not worn, there was no necessity to remove it, but as the hoof was continually growing the relative position of the shoe on the hoof changed. If too long an interval occurred between removals of the shoe then the position of the heel of the shoe would shift from the wall on to the space between the wall and the bar. It would sink inside the wall and press on what was known as the "seat of corn." The result of this pressure would be a bruising of the sole and consequent lameness.

If such a shoe was removed and the horn was examined it would be found after the dirty top layer had been removed, that the horn below was blood-stained or black. This change had been brought about by pressure and a rupture of small blood vessels. As previously pointed out, any damage to the softer tissues inside the horny box was very painful because wherever such damage occurred swelling followed and inside the hoof there was no room for swelling without causing considerable damage to the tissues generally. Therefore, the horse's shoe should always be watched and removed for refitting, if reshoeing was not necessary, every four or five weeks.

Water Movements in Soil—Effects of Cultivation.

The value of water is impressed upon every farmer as a result of his experience. A congenial rainfall invigorates and increases his crop, whereas a period of drought may make his labours abortive. The cultivable soil is supplied with water from three sources; from the clouds, as rain or snow; from the air by absorption, as water vapour; or by condensation, as dew, and from the lower layers of the soil or subsoil by capillarity or "creeping." Artificial methods are adopted where the supply of water is insufficient.

Plants take up an enormous quantity of water—someone has estimated that a crop of oats uses up 400 tons—the greater part of which passes through the pores of their leaves as water vapour into the atmosphere. Evaporation is always taking place, and in hot, dry weather the surface soil becomes exhausted of water, and so shallow-rooted crops are liable to suffer. In windy weather the land dries up very rapidly, as evaporation is increased, owing to the immediate removal of the vapour from the surface of the soil by the agitation of the air.

Drainage has for its object the removal of surface and surplus water, thus enabling the soil to admit air and to keep up a circulation of water in the interstices. Waterlogged soil is useless for crops; independently of drainage, providing the subsoil is porous, the water will sink or creep downwards by capillarity and gravitation. In the case of an impervious subsoil a water table is formed, and the depth at which it occurs is a very important matter for the farmer to ascertain. If near the surface a water table is a source of trouble, as its presence leads to the decline of deep-rooted plants, and, moreover, the loss of water by evaporation may, at a critical time, completely exhaust the supply.

Nature ordains that the soil will store up water during the winter for the use of plants in the spring. Modern cultivation, having for its object the growth of heavy crops, including grass, necessarily entails some provision for the retention of water in the soil. Particles of rocks, earthy materials, and organic or vegetable substances, of which the soil is chiefly composed, are all concerned in the distribution of water. The vegetable fragments absorb large quantities of water, while the rocky and earthy particles retain it by clinging or surface tension. Each particle becomes wrapped, as it were, in a cloak of water of varying thickness. The thickness of the cloak depends upon the water supply, and when a very low limit has been reached the covering gradually disappears owing to capillarity absorption by rootlets and evaporation. A certain quantity of water, however, always surrounds the small fragments in the soil, and when the minimum is reached plants can no longer by their use make use of it, their power of absorption being weaker than the surface tension or clinging force of the particles.

Suppose a farmer takes a big clod in his hand and breaks it up into a dozen smaller ones, he can readily see that the latter will require a much larger amoount of water to cover their surfaces than the original mass. Hence, it is obvious that one means of conserving water in the soil is through cultivation, by which a fine tilth is produced. If one has the draught power, summer cultivation is always the best, especially on clay lands.

As already stated, the soil stores up water during winter. If ploughing is postponed until the early spring the soil not only contains less water, but the water lost during the operation is considerable. Evaporation takes place at considerable depths in the soil, depending largely on the air present, and as the surface temperature in spring is less than that below, the vapour as it rises is condensed, and so a moist surface is the result. In summer the reverse is the case, the surface temperature is the greater, and a dry condition is produced. Too much vegetable matter, as in peat soils, is objectionable, and so are too fine particles; but, if a soil is not naturally clayey, no amount of cultivation will render it so. A good soil is, in reality, a composite; it needs to have enough clay and humus to hold water, and to draw the water to the surface for plant roots when overground drought conditions require it; enough humus and clay to provide food for plants, and enough sand to make it porous, warm, and easily worked.—"The New Zealand Farmer."

Value of Lime in Pasture Making.

The value of lime in pasture making and pasture improvement is becoming more and more apparent as time goes on. Recent experiments carried out by Mr. Robert Laird, West of Scotland College organiser for Ayrshire, are described in an issue of the "North British Agriculturist" just to hand. A special grass seed mixture was sown with the idea of having one year's hay and several years' pasture. As a result of those experiments, it has been concluded that the hay yield was affected less by the composition of seed mixtures than by a number of other factors, the chief of which was the presence, or absence, of a sufficient supply of lime to assist the useful grasses and clovers in establishing themselves. The difference due to this factor was 50 per cent., as opposed to a maximum of 9 per cent. between the seed mixtures.

Points in Dairy Economy.

In a recent survey of milk production in the South-east of England, Mr. James Wyllie makes several important points with regard to dairying economy. For instance, he has a firm belief in the value of roots, especially mangolds, for milch cows (in opposition to some lately expressed opinions) and holds that if mangolds can be grown at a cost 12s. per ton, they form one of the cheapest, as well as one of the best of winter foods. Again, the production of high-quality grass and hay is of the first importance both in economy of feeding and in milk yield.

It is quite as important to reduce feeding costs as to increase milk yield, and the economic balance which gets the best results in the latter from the lowest cost of the former is a point which is only attained by experience.

Again, the most economic size for the herd for milk purposes has often been debated. Mr. Wyllie says that if the cows are to be fed mainly on purchased cakes and meals, a small herd of heavy milkers may be more economical than a large herd of moderate milkers. But if the chief foods are to be grass, hay, and roots a large herd of moderate milkers may yield better net results.

The question of labour costs is also an important one and on the average family farm financial difficulty often begins when extra labour has to be brought in and paid for. The keeping of reliable records of milk production and feeding costs is essential in order to attain the accurate figure to be placed opposite the value of the milk yield. Of course, the farmer—even the smallest—has to be something of a bookkeeper nowadays, in order to keep going, but undoubtedly a closer system, especially in connection with dairy farming, would help him materially.

Wireless Talks to Farmers.

Tuesday, 12th March, 1935—"Winter Pastures," by C. W. Winders, B.Sc. (Agric.).

Thursday, 14th March, 1935—"Grape Culture," by H. Barnes, Director of Fruit Culture.

Tuesday, 19th March, 1935—"Some Remarks on Animal Nutrition," Part I., by E. H. Gurney, Agricultural Chemist.

Thursday, 21st March, 1935—"Some Remarks on Animal Nutrition," Part II., by E. H. Gurney, Agricultural Chemist.

Tuesday, 26th March, 1935—"Observations on Tobacco Fertilizer Trials," by W. J. Cartmill, B.Sc.

Thursday, 28th March, 1935—"Expanding our Export Trade," by J. F. F. Reid, Editor of Publications.

Our Forest Heritage.

A sorry story of lack of foresight in the management of the mountain country of south-east New South Wales and of eastern Victoria was disclosed during the discussion on soil erosion at the Science Congress in Melbourne last month. Indiscriminate timber cutting and uncontrolled grazing, with concomitant bush fires, have greatly depreciated the value of important catchment areas, and completely ruined fertile valleys. Streams have become rushing torrents in time of rains, causing land slides and carrying silt that will, before many years, go a long way towards filling with mud the water storage and irrigation works constructed at such great expense. Mr. A. S. Kenyon, late of the Victorian State Rivers and Water Supply Commission, described the position as heart breaking, and out of the wideness of his experience was able to suggest a line of action which, he hoped, would

check the destruction. This embodies the appointment of an independent board, representative of forest, water, agricultural, and grazing interests, to control the upper catchments of streams. Mr. Kenyon expressed a belief at the congress that under reasonable control forest products could be removed without affecting the water supply to any extent. He was, however, strongly opposed to grazing in any form. The cow, he said, eats the green shoots, lets air into the forest, and ruins the forest cover. There will, probably, be some difference of opinion on the latter points, but nobody can argue seriously against the necessity for taking early action to protect mountain catchments. Only a few days ago the Prime Minister announced that the Cabinet had approved of a grant of £331,000 to the States for the encouragement of afforestation. New South Wales' share will be £50,000, and Victoria's £100,000, and it is expected that the State Governments will supplement the Federal contribution on a £1 for £1 basis. Naturally the whole of the amount will not be expended on the eastern watersheds, but it is the expressed intention of Victoria to spend some of the grant on the establishment of forest camps for youths. Thanks to the generosity of two Melbourne business men, an experimental camp was started in Gippsland, Victoria, some time back. It has done really excellent work in training youths in the management of forest areas, and it is reasonable to believe that similar camps scattered throughout the heavily timbered country would do a power of good.—"The Pastoral Review."

Soil Losses.

Our apathetic attitude towards soil losses, caused by wind and rain, was also referred to at the Science Congress. As Associate-professor G. L. Wood, who opened the question said, it is a matter for wonder that in a country so far committed to policies of State regulation, and where public utilities have been brought under public ownership to such an extent, that supervision of the greatest utility of all—the soil—should have been overlooked. There is abundant evidence that the care and protection of soil throughout Australia are inadequate, and the time has come when we must recognise that many of the activities connected with land utilisation should be re-examined from the viewpoint of their effects on soils beds in particular and on national economy in general. He added that "it is only when the disastrous results, such as gullying and increased frequency and severity of the floods are revealed, that attention is directed for a time to the reality of the peril. In a continent where rural industries are the basis of national wealth, and in which there is such a marked deficiency of water supply over such wide areas, it is difficult to understond this continued neglect by the authorities." We realise that the New South Wales Government has set up an Erosion Committee, and offers advice through its official publications in connection with checking erosion under given circumstances. Little or nothing appears to have been done in other States, however, and it is to be hoped that the strictures of scientists will awake Governments to some sense of responsibility. It is admitted that comprehensive plans to prevent soil losses in toto may not be easy to devise. It may be impossible to find a complete cure, but much can be done if the problem is attacked from the right angle. It is generally acknowledged that the removal of timber, scrub, and even pasture cover is a common cause of erosion with light sandy country. A partial solution there seems to lie in the direction of preventing further settlement of such lands without proper safeguards in the matter of wind breaks.—"The Pastoral Review."

The Stockman is an Artist.

If the cows were standard machines, like mass-produced cars, the treatment and feeding of them could be standardised, but no real stockman can ever forget the individuality of the animals he looks after. Each cow in a long byre will have its own peculiarities quite well known to the stockman. The two great indications every true stockman looks for are, firstly, the bloom on the coat, and, secondly, the state of the dung. A cow in good yield should never be hard in her droppings, and although this is true and a certain looseness is desirable, anything like real scour should be investigated at once and the cause removed and the feeding adjusted. It is occasionally necessary, if the cow has been pushed just a trifle too hard, to cut her concentrates out for a day and give her bran mashes, and bring her back to her full ration by degrees. Whatever general principles may be laid down by pundits, the real stockman will always remember that it is his job to adjust the broad general principles of feeding and management to a multitude of individual peculiarities in his charges. That is what makes a stockman's job such an interesting one.—H. E. Shand in "The Farmer and Stock-Breeder."

Be Careful with Arsenic.

At an inquest at Wagga (New South Wales) recently the Coroner found that a man had died from arsenic poisoning accidentally self-administered. The evidence disclosed that the man had been engaged dipping sheep on Brewarrina Station. Without washing and with portion of his clothing saturated with the sheep dip, he took his afernoon tea, sitting on a drum of sheep dip which had some of the dip on the top of it. The assumption was that some of his food came in contact with the poison, for half an hour later he complained of sickness and collapsed. He was admitted to Wagga Hospital but died three days later.

Horse and Tractor Cultivation Compared.

The different kinds of implements used in soil cultivation have all developed from a pointed stick whose function was to stir and break up the soil. Cultivators and harrows are in the direct line of descent from the pointed stick; the plough represents a divergence from the line, in that its purpose is to invert the soil rather than to stir it. The extremes of plough design are the sod or grassland plough which turns over an almost unbroken ribbon of soil, and the digger-breasted plough, common in continental areas, which turns over a rough broken furrow with the maximum of disruption and mixing.

Before the advent of the tractor, the design of cultivation implements and their methods of use had evolved subject to two basic considerations: a supply of cheap and abundant labour, and a forward speed of 2-2½ m.p.h. which suited the natural walk of both horse and man.

At first the tractor had little effect on these considerations—it was regarded as a more powerful haulage agent than horses, and, therefore, suitable for heavy jobs, such as stubble-breaking and deep ploughing. With further experience, and with the better designs of the tools for the lighter forms of cultivation, the scope of the tractor rapidly increased. The addition of such improvements as the power take-off and the development of power-operated implements for the hay crop opened up additional uses for the tractor as a farm tool. There is little doubt that a steady increase has taken place in the number of hours' work per year put in by the tractor on the average farm. Periodical censuses carried out by the Agricultural Economics Research Institute, Oxford, on farms employing both tractors and horses show that the hours of work of the tractor per year on all jobs are about half those put in by the horse. There is undoubtedly room for this figure to be appreciably increased, the general introduction of rubber tyres may help here.

But, desirable in many ways though this increase may be, it must be remembered that the outstanding advantage of the tractor is its ability to deal quickly with urgent work. Farming cannot be done to a rigid time-table; the weather is the controlling factor. In unfavourable seasons the farmer may be unable to work his soil when he wishes. He must produce a suitable tilth before he sows, and for this he may be compelled to wait so long that his crop, when sown at last, is almost certain to suffer in yield.

It is in such conditions, and in the preparation of land for the next crop, immediately after the current one is harvested, that the tractor finds a most useful avenue of employment. Similarly, in preparing the soil for spring-sown crops, the inevitable rush of work in the few fine spells in a wet spring can be tackled with some hope of success.

The economic value of this reserve of power, especially to the farmer on heavy land, is incontrovertible. The tractor enables him to cut costs directly, but even more important is the indirect cost-cutting, through the ability to get work completed in unfavourable spells. No costings system can show the money value of indirect savings, for obvious reasons, but no farmers would dispute their importance.

Agricultural economists have made numerous comparisons of tractor and horse costings on the farm. In common with all agricultural costing data, they present difficulties which do not arise in other industries. Take as a simple example the cost of keeping a horse. It will be fed, wholly or partly, on food grown on the farm. What figure should be assigned to this food? It should be less than the market price of the foodstuff, but to what extent? It is not even possible to state the exact cost incurred by the farmer in growing his food, since the yield is controlled, to a degree not precisely known, by the residual value of the manures applied to the preceding crops.

Some conventions must therefore be adopted, on which agricultural economists have not yet arrived at complete agreement. But, in spite of these inherent difficulties, direct comparisons of horse and tractor costings are capable of showing in what way the tractor can achieve a direct saving as compared with horse-power.

Some typical results are given in the following table, which has been constructed from figures supplied by agricultural economists. The figures, which are some years old, apply to individual farms employing both horses and tractors, and this partly accounts for the wide variations in costs for the same work. For our present purpose, however, this does not matter:—

COST PER ACRE FOR HORSE AND TRACTOR—WAGES INCLUDED.

Ploughing:
Horse, 20s., 19s. 10d., 14s. 10d., 17s. 2d.
Tractor, 15s. 9d., 14s. 6d., 11s. 11d., 8s.

Cultivating:
Horse, 2s. 6d., 4s.
Tractor, 3s. 6d., 4s. 5d.

Harrowing:
Horse, 1s. 6d.
Tractor, 3s. 6d.

Rolling:
Horse, 1s. 6d.
Tractor, 2s. 1d.

Harvest:
Horse, 2s. 7d., 2s. 8d., 2s. 1d.
Tractor, 3s. 11d., 3s. 6d., 4s. 7½d.

The salient feature of the table is that on all these farms tractor ploughing is cheaper than horse ploughing, while in all the other operations the reverse is the case. The explanation is simply that in ploughing the tractor is given a full load, while in the other operations it is working below its capacity. The practical implication is, therefore, that all tractor cultivation tools should be designed to give a full load like the plough. The modern tractor cultivator already does this, but there is still scope for the farmer to use gangs of harrows to increase the resistance for this naturally light type of cultivation.

The above results have an important bearing on the question of complete mechanisation of arable farming. Here it should presumably be easier to design the equipment and to operate it so that a full load is always given, although in most parts of the country extensive and perhaps costly alterations in the field boundaries would be needed.—From a paper on "Functions of Mechanical Power in Soil Cultivation," read at the Institution of Automobile Engineers by Dr. B. A. Keen, Assistant Director Rothamsted Experimental Station

Better Agriculture—Philosophy of "Good Enough."

Surveying the general field of Australian agricultural education, Professor J. K. Murray (Q.), in his presidential address to the agricultural section of the Science Congress in Melbourne, deplored the fact that of all the young men about to enter grazing or farming in any one year in any one State of the Commonwealth, considerably less than 100 would have passed through a full State Agricultural College course. An outstanding feature of modern life, he said, was that, despite the spectacular successes of research, communities spent on research only a small fraction of the money willingly voted for war or defence. The Council for Scientific and Industrial Research, the Waite Research Institute, the Glenfield Veterinary Research Station and others had produced results which indicated that agricultural research in the aggregate paid in hard cash. The agricultural colleges, developed apart from University faculties and from State colleges, had been in being for many years before the first Australian faculty of agriculture was founded. They were not to remain entirely apart, however; at the founding of the Queensland University, for instance, provision was made in the status for the affiliation of the State Agricultural College. It was a very definite and easily-argued premise that sound steps in the solution of an agricultural problem depended on an adequate statement and investigation of it. Notable requirements were an adequate pasture research organisation for tropical and sub-tropical dairying conditions, for cattle and sheep conditions generally, and a dairy research institute for the elucidation of problems in production and manufacture not elsewhere satisfactorily handled. Satisfaction with a production figure of 160 lb. per cow lactation, with cheddar as practically our only cheese, and with low percentage figures of choicest in our export butter and cheese bespoke either a "good enough" philosophy, or a lack of knowledge how to do better, or a sound attitude in accordance with the economic facts of the situation.

PLATE 133.—A QUEENSLAND FARM HOMESTEAD.

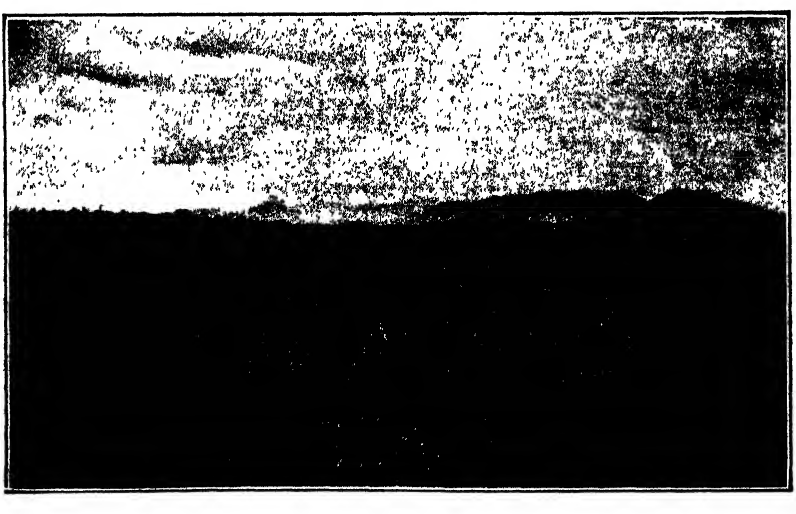


PLATE 134.—PASTURE, WOODLAND, AND MOUNTAIN RANGE.
A scene in the Fassifern Valley, Queensland.

Plate 135.—Forested Slopes and Fertile Farm Land in the Fassifern Valley.

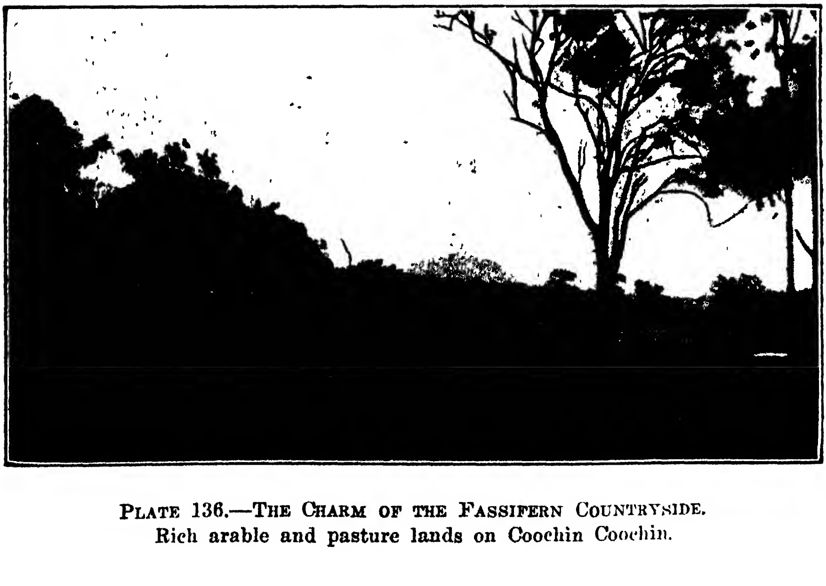


Plate 136.—The Charm of the Fassifern Countryside.
Rich arable and pasture lands on Coochin Coochin.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE TEETH OF OUR PEOPLE A NATIONAL DISGRACE.

The Extent of the Evil.

IN Sydney last August a combined meeting of medical men and dentists debated at length the causes of our bad teeth. On two points there was universal agreement. Firstly, as to the extent and importance of this evil. It was agreed that from 90 to 95 per cent. of our children have imperfect teeth, and that after childhood some diseases of the teeth is almost universal. Its bad effects on general health were recognised by all present. One medical authority was quoted as having stated that 20 per cent. of all chronic diseases were due directly or indirectly to the teeth. Another had traced over twenty-eight systemic diseases to the same cause.

Faulty Diet is the Cause.

It was also agreed by all that the condition of our teeth is caused by what we put into our mouths. In other words, it is the result of the foods consumed by civilised peoples. To find perfect teeth nowadays we must search out primitive races living on primitive diets, and even these are beginning to be hard to find. It is interesting to know that in the Eskimo language there is no word for toothache, and that the Maoris living under native conditions had almost perfect teeth. But when primitive races take to civilised diets their teeth rapidly become as bad as ours.

Differences of Opinion.

As to the exact method by which our civilised diet destroys our teeth there was much difference of opinion. Most of the speakers had each his own theory. Not content with advocating this, each considered it necessary to discredit every other theory. At first reading this is very confusing; but a little reflection makes it appear probable that the true explanation is more complex than many allow, and that the inability to admit more than one mode of causation is a human weakness that we should do well to avoid.

Two diseases are recognised. Firstly, the decay of teeth, or dental caries, which is most prevalent in childhood, but extends throughout life; and, secondly, a disease of the tooth-sockets known by the ugly and often misused term pyorrhœa. The latter is a disease of adult life, though its early beginnings may be traced in childhood. As our space is limited we will deal only with the former. For this three main explanations, with some differences of detail, were offered.

Weakly Built Teeth.

Careful research has recently shown that a very large percentage of both temporary and permanent teeth are of poor structure and

imperfectly calcified. There can be no doubt that such teeth will decay more easily than strong well-formed teeth. When such teeth emerge with fissures or pits, they are actually inviting caries. The liability of a tooth to destruction depends largely on its structure. To make good teeth an abundant supply of Vitamin D and a sufficiency of calcium and phosphorous are needed, more particularly when the diet consists largely of cereals (bread, flour, oatmeal). These necessities are supplied by milk, butter, cheese, eggs, liver, and green vegetables. The diet of the expectant mother is usually deficient in milk and green vegetables. For the infant and young child the addition of cod liver oil is recommended. On such a diet even caries that has already commenced may sometimes be arrested.

We cannot agree with those who see no other cause than this. Even though teeth are weak and easily destroyed, there must be some exciting cause. Even the weakest bridge does not break down until it bears some load, and a flawed cricket bat will not split until it hits a ball. There must be some further cause for caries besides structural defects.

Poorly Developed Jaws from Want of Use.

Great importance is placed by some on the use of the jaws by the developing child. Soft pappy foods so popular with mothers do not provide this exercise A limb which is disused does not develop properly, and the same is true of the jaws. If the jaws are underdeveloped the teeth are overcrowded and underdeveloped also. What the child needs is plenty of hard, dry, crisp food.

Though too much weight may be attached to this factor, we agree that it is of real importance.

Erosion of the Teeth by Acids.

Acid fruit juices are harmless, for they excite a flow of saliva by which the acids are neutralised. Indeed, they exert a beneficial cleansing effect. The dangerous foods are soft and well-cooked starches, or sugar and starch given in such a way as to produce a sticky mass, for instance, chocolate, sticky sweets, sweet cakes and biscuits. Even bread may be harmful. All of these undergo an acid fermentation and cause decay in any tooth area protected from natural cleansing by lips and tongue, that is, in fissures and pits in the teeth, and in interstices between the teeth. Here we have a cause increasingly prevalent in modern diets. Cheap, satisfying, tasteful, backed up by great commercial interests these tooth-destroying foods have an irresistible appeal to those who "eat what they like."

The Moral.

Let expectant mothers take plenty of good fresh milk and green vegetables. Let all babies be breast-fed wherever possible. Let those artificially fed have some cod liver oil. Let every child take a pint of milk daily. Give your children more potatoes and less bread. Especially do not give them bread between meals. After all meals containing bread see that their teeth are well cleaned. Cut out all chocolates, sticky sweets, and biscuits made out of finely ground flour. Give children hard crisp food instead of pap and mush, and don't be afraid of letting them use their teeth. Foods that are good for children are good for mothers also, and if mothers will eat them they will have no difficulty in getting their children to do so.

IN THE FARM KITCHEN.

ART IN BOILING AN EGG.

Thus Janet L. Rankin, in "Eggs," a publication devoted to the Poultry Industry:—Appetising, nourishing, quickly and easily prepared, eggs in their simpler forms are, she states, amongst our most valuable foods. Like milk, they are a tissue-building food, and, if properly cooked, contain all the vitamins in their most easily digested form. So many recipes go wrong because the method, rather than the recipe, is at fault; so it would be as well first to understand how to treat eggs for the different functions for which you intend them.

There is one definite rule I would give you which applies in all cases: Never cook eggs at a high temperature. Eggs begin to set (or coagulate) at 170 degrees to 176 degrees F. Water does not boil until it reaches 212 degrees F., so when an egg is placed in merrily bubbling water it is being subjected to nearly 50 degrees more heat than it needs, and it is, consequently, far tougher and less easily digested than it ought to be.

The very expression, "boiled egg," should never have come into being, for no egg ever should be boiled. The best way to "cook" an egg in its shell is to put it on in cold water, and when it comes to the boil remove from the heat and leave it for one, two, or three minutes, according to whether soft or medium cooked eggs are liked. This will give a delicate, tender texture.

A poached egg, as a rule, is not subjected to such fiery treatment, for, if it were left over great heat, the albumen would soon break up and harden and boil over the sides of the pan, as if in protest.

So, while this low temperature principle is in your mind, we will go right on to the important summer function of the egg, when it acts as a thickening agent. What can equal the smooth, velvety thickness of a well-made egg custard, and it is so simple if the eggs are properly treated. The other day a town friend said to me: "I always use custard powder, as my egg custards always curdle." She put the accent on "curdle" as if it were the fault of the eggs, poor things, so I explained my golden rule: "Never cook eggs at too high a temperature"—and now she is beating me at my own game!

There are two ways of making satisfactory custards and sauces—one is to place the saucepan over a low flame and watch it like a cat watching a mouse, stirring intelligently all the time until the mixture thickens. The other way is to use a double saucepan, also over a moderate heat. I prefer the latter, and when a double boiler is not available, I use a bowl or jar stood in a pan half full of hot water. For baked puddings, custards, and pies, which contain an important proportion of eggs, these we set in a dish or pan of warm water in the oven, just as we set the saucepan over another containing hot water.

My foundation recipe for "boiled" custard (do not forget, it should never actually boil!), one pint milk, two large eggs (or three small ones), two tablespoonfuls sugar, one-eighth teaspoonful salt. Flavouring to taste (lemon rind, vanilla, cinnamon, &c.). Scald the milk with the flavouring in the double saucepan. Beat the eggs slightly, add the sugar and salt, and then gently add the scalded milk, stirring all the time (remove any lemon rind, &c.). Return the mixture to the saucepan and stir until thick and smooth.

A very good variation of the above is made by using three large eggs instead of two, separating the yolks from the whites. Use the yolks for thickening, as in previous recipe. Whip the whites very stiffly and fold in lightly at the last. This makes a delicious spongy custard, ideal to trifles or for serving with fruit.

TOMATO RECIPES.

EACH year the prestige of the tomato as an item of food is enhanced. In America tomato-juice as a cocktail has largely supplanted the more potent variety. As soup, salad, and savoury it appears in a score of ways. The recipes given cover dishes hot and cold, simple and rich.

Tomato Souffle.

Take 1 cup tomato pulp, 1 tablespoonful butter, 2 tablespoonfuls grated cheese, 3 eggs, ½ cup breadcrumbs or crumbled granose biscuits, 1 teaspoonful made mustard, salt, and pepper. Mix together all the ingredients except the eggs and bring to the boil. When cool add the beaten egg-yolks, and lastly the egg whites beaten very stiff. Pour into a buttered dish, sprinkle with breadcrumbs and a little grated cheese, and bake in a hot oven for 15 minutes.

Tomato Savoury.

Take a number of pieces of hot buttered toast and the same number of thick slices of tomato. Dip the tomato slices in egg and cracker crumbs and fry in butter. Place on the toast, sprinkle with grated cheese and chopped capers, season with pepper and salt, and put in the oven till the cheese is browned.

Tomato Fritters.

Take 2 eggs, ½ cup self-raising flour, pinch salt and pepper, and a teaspoon of chopped parsley or sage. Make a batter with a quarter of a cup of milk, cut some tomatoes in thick slices, dip in batter, and fry to a golden brown.

Tomatoes and Peas.

Take three or four firm medium-sized tomatoes, cut them in half and scoop out some of the pulp. Season with pepper and salt and a finely-chopped onion, place in a buttered dish, and bake in the oven for about ten minutes. Prepare ½ pint rich white sauce, add to it two beaten egg-yolks, and stir over the fire till thick. Season with pepper and salt and a pinch of chopped mint, add two cups of carefully-cooked green peas, make all thoroughly hot, and, when the tomatoes are cooked, fill with this mixture and serve.

Stuffed Tomatoes.

All sorts of tasty little odds and ends may be used for stuffing tomatoes. Use firm tomatoes, cut a slice from the top, and scoop out some of the pulp. Mix with the pulp some grated cheese and breadcrumbs, minced meat, chicken, or ham, smoked or free cooked fish, mushrooms, or celery. Flavour with pepper and salt, refill the tomatoes, sprinkle with fine breadcrumbs, and place on the top of each a small piece of butter. Bake in a moderate oven for twenty minutes.

Tomato Toast.

Take 1 ripe tomato, 1 egg, 1 oz. cooked ham, ½ oz. butter, a flavouring of onion, salt, and pepper. Peel the tomato, cut up, and mince the ham and onion. Melt the butter, add the tomato, and cook for a few minutes, stirring all the time. Take from the fire to cool slightly, add the beaten egg, stir over the fire till it thickens, and serve on hot buttered toast.

Tomatoes with Cheese Cream.

Take 3 or 4 tomatoes, 1 gill cream, 1½ oz. grated parmesan cheese, 2 tablespoonfuls aspic jelly, salt, and pepper. Cut the tomatoes in half, remove some of the pulp, and drain them. Whip the cream stiffly, season with salt and pepper, whisk in the aspic jelly, which should be liquid, but cold. Add the grated cheese, fill the tomato shells, and pipe a pretty border with a rose-pipe. Garnish with cress and serve very cold.

Stuffed Tomato Salads.

Take firm tomatoes, of uniform size (if very large, cut them in half; if small, cut a slice from the top). Scoop out some of the pulp and drain the tomato. Fill with the following fillings, or with any other savoury mixture on hand:—

(1) Pickled walnuts, new cold potatoes, chopped parsley, and mayonnaise.
(2) Chopped celery, shredded pineapple, and mayonnaise.
(3) The heart of a small cabbage finely shredded, 1 tablespoonful grated onion, and some mustard dressing.
(4) Chopped ham, mixed with aspic jelly and a little of the tomato pulp. Season well, fill the tomatoes, and set on ice.
(5) Put the pulp on the fire, add 1 teaspoonful of gelatine, and cook. Add some diced beetroot, chopped gherkins and capers, and fill the tomato-cases.

Tomato Moulds.

Peel some tomatoes and scoop out some of the pulp. Fill with chopped celery and a little mayonnaise dressing. Lime small moulds with aspic jelly, and, when set, put in each a filled tomato. Fill the moulds with aspic jelly, set on ice, and turn out on a lettuce leaf.

Tomato and Apple Salad.

Place a thick slice of tomato on a lettuce leaf. Shred some lettuce very finely and mix with mayonnaise. Place some on the top of each slice of tomato, then a tablespoonful of very finely shredded apple, mixed with a little chopped mint.

Tomato Sauce.

This sauce may be served with any meat, fish, or vegetable entrees. Take 2 oz. butter, 2 oz. flour, 1 lb. tomatoes, 1 small onion or eschalot, pinch of sugar, pepper, and salt, 1 oz. ham or bacon, ½ pint stock or water. Melt the butter in a saucepan, fry the chopped onion and ham, add the flour, brown slightly, stir in the stock or water, and bring to the boil. Add the tomatoes and cook for half an hour. Strain and season.

Tomato Relish.

Take 5 lb. tomatoes, 1½ lb. apples, 4 lb. sugar, 1 pint vinegar, ¼ oz. cinnamon bark, ¼ oz. ginger, 3 blades of mace, and a few cloves. Cook slowly till quite thick, and, when cool, bottle in jars. It is delicious for sandwiches or flavouring, and may be used with cold meat.

Tomato and Pineapple Jam.

Take 6 lb. firm tomatoes (peeled and sliced), 1 large pineapple cut into dice, 4½ lb. sugar, pinch of salt, and the juice of 3 lemons. Boil the pineapple with 1 lb. sugar until it is soft, add tomatoes and the rest of the sugar, and boil rapidly for about one hour. Add lemon-juice and salt and test on a plate to see if it will set when cool. When ready remove from the fire and bottle while still hot.—E.S., in the "Sydney Morning Herald."

Tomato Jam.

Wash and stem the tomatoes, place in cooking vessel, crush sufficient of the fruit to start boiling, and reduce the whole to pulp by boiling, say for half to three-quarters of an hour. Strain all the pulp through a ¼-inch mesh sieve and weigh. Add ¾ lb. sugar for each pound of pulp, and bring to the boil. The cooking time cannot be stated definitely, there being many influencing factors. Fast boiling for approximately an hour to an hour and a-quarter will produce the desired consistency.

As tomato jam made to this recipe is inclined to be insipid, the addition of a little acid in the form of citric or tartaric or pineapple, &c., is a decided improvement. The addition of acid should be done when the jam is about half cooked, and at the rate of 1 oz. to 25 lb. of pulp. Lemon juice may be substituted for tartaric, and if it is desired to use the whole lemons, they should be cut up into very thin slices and boiled for, say, half an hour before being added to the jam.

Apple pectin added to tomato jam has proved a decided success, supplying bulk, combination, and acid in one.

POINTS IN JAM-MAKING.

Use the best crystallised sugar.

The fruit should be sound and not too ripe.

Boil fast, as this preserves the colour and flavour.

Stir as little as possible, for stirring breaks up the fruit and renders it more liable to burn.

Make small quantities at a time; large quantities are not always a success.

Skim off impurities and do not use iron or tin preserving pans.

Use a wooden or an aluminium spoon for stirring.

Seal the jars down perfectly to keep airtight.

Store in a dry, dark pantry.

VEGETABLES AND HOW TO COOK THEM.

Vegetables, as they are ordinarily spoken of, may be classified as (1) fresh—(*a*) starchy, e.g., potatoes, parsnips; (*b*) non-starchy, e.g., cabbage, carrots, lettuce, spinach; and (2) dried—being the ripened seeds of certain plants, such as peas and beans.

Food Value of Vegetables.

The food functions of these two classes of vegetables are distinctly different. The fresh vegetables are composed chiefly of water, most of them containing over 80 per cent. of it. In so far as nutriment is concerned, they are of little value. Some of the vegetables, such as potatoes, beets, carrots, parsnips, &c., do contain a considerable quantity of starch and sugar, which produce heat and energy in the body, but it would be more economical to obtain this from other sources of food such as bread and cereals.

The fresh vegetables have specific purposes in the human diet which no other foodstuff can supply.

(1) They are one of our most valuable sources of mineral salts. These salts are mostly compounds of potash, which are most valuable anti-scorbutics or blood regulators. A deficiency of green vegetables sometimes causes eczema.

(2) Fresh vegetables supply ballast to the intestines. The cellulose or indigestible fibrous material they contain is a stimulus to the movement of the intestine; hence their special value in constipation.

The dried vegetables have a higher food value, being so rich in protein that they have been described as "the poor man's beef." The mineral matter in these vegetables is composed largely of potash and lime.

Cooking of Vegetables.

Knowing the importance of the generous use all the year round of vegetables in the diet, it is worth while considering the best methods of cooking.

Following general rules, to obtain good results in cooking fresh vegetables, it is important that they should be crisp and firm. If not taken directly from the garden, they should be crisped in cold water before cooking. Cabbage and cauliflower should be soaked for one hour in cold, salted water. When cooking vegetables, they should be put in fresh, boiling water. Use one teaspoon salt to each quart of water, but do not add until vegetables are almost done as salt tends to harden the tissues. Use only enough water to prevent burning.

Strong-smelling Vegetables.

There has been rather general belief that strong-smelling vegetables, like cabbage, onions, and cauliflower, should be closely covered and simmered or cooked just below boiling point. It has been found that these vegetables can be left uncovered and allowed to boil rapidly without leaving any noticeable odour in the room. A larger amount of water must be used than in the case of mild flavoured vegetables. A crust of bread put into the water and cooked with the vegetables will assist in dispelling the odour. The addition of soda destroys the vitamin value and therefore should not be used.

Time of Cooking.

Vegetables should be cooked until tender, but overcooking breaks up and wastes them, and in some cases develops undesirable flavours. As soon as the vegetables are tender, they should be drained and seasoned. If the vegetable water is saved and used in making a sauce, so much more of the flavour and mineral salts are retained. This method is particularly good for young carrots, asparagus, and some of the more delicately-flavoured vegetables.

Cooking Dried Vegetables.

The important point in cooking dried vegetables—ripe peas, beans, and lentils, which are rich in protein or tissue-building material, is not to cook them at too high a temperature. The protein, which is called legumin in these plants, like the protein in egg-white or meat, is toughened by strong heat. To avoid this, they should be simmered or cooked just below boiling point. On account of the dense, tough texture of those vegetables, and the small quantity of water they contain, they should be soaked overnight to soften the cellulose and shorten the

time of cooking. The soaking also improves the flavour by dissolving out a bitter substance. It is also important that the water in which they are cooked be softened, either by adding a little baking-soda or boiling the water before it is used to get rid of the lime, as lime has a tendency to toughen the legumin. When beans are large, like lime beans, the tough outer skin is sometimes removed when it has been loosened by soaking, as the skins make the digestion difficult for some people. This difficulty is overcome where the beans are made into soup. The dried vegetables, being themselves so rich in protein, should be served as a meat substitute rather than with meat.

The general rules, then, for cooking dried vegetables, would be to wash them and soak them overnight in water softened by adding one quarter of a teaspoon of baking soda to one quart of water. In the morning, drain, rinse, and put on to cook in cold water; let come to a boil, drain, cover with boiling water, and simmer until dry.

NOTICE TO SUBSCRIBERS.

SPECIAL AND IMPORTANT.

Under the Commonwealth Postal Regulations it is NO LONGER PERMISSIBLE to indicate the expiry of subscriptions with a BLUE CROSS on the first page of the Journal. So in the future that reminder will NOT appear.

The need for the strictest economy makes any other form of reminder at present impracticable. THE ONUS OF REMEMBERING THE DATE OF EXPIRY OF, AND RENEWING THE SUBSCRIPTION PROMPTLY IS, THEREFORE, PLACED ON EACH SUBSCRIBER.

As about 1,000 subscriptions expire each month, the cost of a postal reminder is, in present circumstances, prohibitive. Readers will, therefore, appreciate that fact, and will, no doubt, help us to retain their names on our mailing list by kindly noting the date of payment of their subscriptions and, on expiry, sending in their renewals at once.

Instead of just sending the annual subscription—one shilling—along, it is suggested that, when renewing, they do so for two or three years, or even a longer term. For instance, FIVE SHILLINGS would keep a name on our subscribers' register for FIVE YEARS.

By doing this subscribers would help greatly in reducing clerical labour, as well as avoid the inconvenience to themselves of posting annually the very small sum necessary for their registration.

Readers renewing their subscriptions should USE THE ORDER FORM on another page, which should be filled in FULLY and CORRECTLY. Renewals by letter do not as a rule give the essential information, thereby causing unnecessary waste of time and much inconvenience. The Form is also our record, and orders which come by letter require special handling to adapt them to our card recording system.

When an address on the Order Form is not that to which the Journal has hitherto been sent, attention should be called to the new address, and the former address given. This assists us to identify subscribers, of whom we have many of the same name, often in the same district, as well as in different parts of the State.

Women subscribers should add to their names the word "Mrs." or "Miss," as the case may be. This is a constantly recurring omission, and its correction causes a lot of unnecessary labour in checking electoral rolls and other references. Wives and children of subscribers should apply in the subscriber's name, and so facilitate registration.

Well and Sub-Artesian Bore Sites

The services of the Government Water Finder (Mr. J. H. Bestmann) are available to settlers in Queensland for the purpose of locating well or sub-artesian bore sites.

A fee of 10s. is charged for each site selected, together with a mileage rate of 1s. a mile (one way) from the nearest railway station to the site.

Applications should be addressed to the Secretary, Land Administration Board (Public Estate Improvement Section), Department of Public Lands, Brisbane.

Note.—The Water Finder will be sent to distant localities only if there are a sufficient number of applications from such localities to warrant the necessary expenditure.

"The Farm Produce Agents Acts, 1917 to 1932."

Brabant & Co., of Brisbane, have applied for a refund of the deposit of £1,000 lodged with the Minister as security under "*The Farm Produce Agents Acts*, 1917 *to* 1932."

It is the intention of the Minister to make this refund to Brabant & Co., on the 1st April, 1935, subject to any claims that may be received before such date and allowed against such deposit by way of compensation under the said Acts and Regulations.

By direction of the Secretary for Agriculture and Stock.

W. GETTONS, Registrar,
Farm Produce Agents, Brisbane.

Orchard Notes for April.

THE COASTAL DISTRICTS.

IN the Orchard Notes for March the attention of citrus-growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known as blue mould—a rotting of the fruit caused by a mould fungus—and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus-growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that blue mould cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing blue mould can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury. The cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and blue mould follows in due course.

The remedy for blue mould is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of blue mould or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For oversea and interstate markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to export, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, for from now until the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, firstly, to retain moisture in the soil, and, secondly, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land time to sweeten before planting.

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth, and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of Bordeaux mixture, a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed-bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

HOW MANY TURNS TO THE ACRE?

A man driving a team ought to know what distance he must travel with a given width of machine to cover an acre. It can be ascertained by dividing the width of cut of machine in feet into 660. Thus a 6-feet harvester travels 110 chains to do an acre, a 10-feet machine 66 chains, and so on.

TO UNREEL BARBED WIRE.

Run an iron rod through the roll of wire and over each end of the rod slip a small jam tin with a hole in the centre of the bottom. Then loop a trace chain over the end of the rod at each side and attach a swingle-bar to the middle of the chain. The free end of the wire is fastened to a post and a horse hooked to the swingle-bar on the wire and the roll pulled along. The wire not only comes out straight, but most of the slack is taken up and there is very little straining to do.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.,	No. of Years' Records.	Jan., 1935.	Jan., 1934.
North Coast.	In.		In.	In.
Atherton	12·30	34	5·04	22·09
Cairns	16·91	53	5·58	23·72
Cardwell	17·25	63	2·36	46·17
Cooktown	14·58	59	10·82	16·03
Herberton	9·78	49	6·34	18·66
Ingham	16·05	43	3·61	31·23
Innisfail	20·69	54	7·10	35·60
Mossman Mill	18·15	22	18·97	33·75
Townsville	11·16	64	2·76	13·87
Central Coast.				
Ayr	11·19	48	0·93	9·60
Bowen	10·15	64	2·37	8·06
Charters Towers	5·51	53	3·02	6·93
Mackay	14·33	64	4·34	5·38
Proserpine	16·01	32	7·04	7·75
St. Lawrence	9·34	64	5·58	0·87
South Coast.				
Biggenden	5·26	36	3·15	0·39
Bundaberg	8·82	52	2·97	1·28
Brisbane	6·44	84	5·75	3·26
Caboolture	7·65	48	5·96	4·34
Childers	7·51	40	4·81	1·28
Crohamhurst	12·53	42	7·45	9·21
Esk	5·71	48	6·18	4·83
Gayndah	4·63	64	2·24	0·52
Gympie	6·66	65	3·74	3·24
Kilkivan	5·55	56	4·44	2·79
Maryborough	7·21	64	4·66	2·44
Nambour	9·76	39	6·67	4·98
Nanango	4·64	53	5·78	2·14
Rockhampton	7·74	64	4·11	1·77
Woodford	7·86	48	5·23	5·75

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.,	No. of Years' Records.	Jan., 1935.	Jan., 1934.
Central Highlands.	In.		In.	In.
Clermont	5·15	64	2·40	1·78
Gindie	3·73	36	..	0·08
Springsure	4·20	66	4·49	0·29
Darling Downs.				
Dalby	3·26	65	7·02	2·13
Emu Vale	3·21	39	3·05	3·89
Hermitage	3·26	29	..	3·67
Jimbour	3·49	47	3·84	1·56
Miles	3·63	50	5·23	3·77
Stanthorpe	3·58	62	4·00	4·06
Toowoomba	5·08	63	3·34	5·42
Warwick	3·56	70	2·50	3·90
Maranoa.				
Roma	3·09	61	2·76	0·55
State Farms, &c.				
Bungeworgoral	1·78	21	2·76	0·54
Gatton College	4·30	36	3·73	4·54
Kairi	9·87	21	2·42	20·82
Mackay Sugar Experiment Station	14·32	38	3·75	5·01

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JANUARY, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·72	91	72	104	17	67	7	1,145	12
Herberton	..	85	66	92	17	60	13	634	12
Rockhampton	29·79	92	73	98	1	68	21	411	5
Brisbane	29·84	87	69	95	1	61	7	575	10
Darling Downs.									
Dalby	29·82	88	64	94	27	53	7	702	8
Stanthorpe	..	82	58	90	27	44	7	400	8
Toowoomba	..	83	62	92	27	49	6	334	10
Mid-Interior.									
Georgetown	29·74	97	75	104	1	69	7, 29	530	9
Longreach	29·72	104	75	112	1	60	7	112	1
Mitchell	29·77	95	67	104	28	50	7	105	5
Western.									
Burketown	29·71	95	79	104	1	70	19	1,537	7
Boulia	29·71	103	77	112	12	65	7	112	6
Thargomindah	29·76	99	74	109	12	62	6, 7	30	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March. 1935.		April. 1935.		MOONRISE. Mar., 1935.	MOONRISE. Apr., 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·45	6·25	6·2	5·50	12·56	3·9
2	5·45	6·24	6·3	5 49	2·2	4·17
3	5·46	6·23	6·3	5·48	3·12	5 23
4	5·46	6·21	6·4	5·46	4·22	6·29
5	5·47	6·20	6 4	5·45	5·31	7·34
6	5.48	6·19	6·5	5·44	6·37	8·41
7	5·48	6·18	6·5	5·43	7·44	9·45
8	5·49	6·17	6·6	5·42	8 51	10·45
9	5·50	6·16	6·6	5·41	9·57	11·30
						p.m.
10	5·51	6·15	6·7	5·40	11·1	12·27
11	5·51	6·13	6·7	5·39	12 noon	1·11
					p.m.	
12	5·52	6·12	6·8	5·38	12·57	1·48
13	5·52	6·11	6·8	5·37	1·47	2·20
14	5·53	6·10	6·9	5·36	2·38	2·51
15	5·54	6·9	6·9	5·35	3·15	3·18
16	5·54	6·8	6·9	5·35	3·49	3·48
17	5·55	6·7	6·10	5·34	4·21	4·18
18	5·55	6·6	6·10	5·33	4·48	4·48
19	5·56	6·5	6·11	5·32	5·17	5·24
20	5·56	6·4	6·11	5·31	5·47	6·5
21	5·57	6·3	6·12	5·30	6·19	6·51
22	5·57	6·2	6·12	5·29	6·51	7·44
23	5·58	6·1	6·13	5·28	7·25	8·40
24	5·58	6·0	6·14	5·26	8·5	9·42
25	5·59	5.59	6·14	5·25	8·53	10·46
26	5·59	5·58	6·15	5·24	9·47	11·53
27	6·0	5 57	6·15	5·24	10·46	a.m.
28	6·0	5·55	6·16	5·23	11·48	12·57
29	6·1	5·54	6·16	5·22	a.m.	2·2
30	6·1	5 53	6·17	5·21	12·54	3·5
31	6·2	5·52			2·4	

Phases of the Moon, Occultations, &c.

5 March	● New Moon	12 40 p.m.
12 „	☾ First Quarter	10 30 a.m.
20 „	○ Full Moon	3 31 p.m.
28 „	☽ Last Quarter	6 51 a.m.

Perigee, 4th March, at 9.54 p.m.
Apogee, 17th March, at 2.36 p.m.

Neptune, on the 4th, will be in opposition to the Sun, rising as the Sun sets. Its distance from the Earth, about 2,885 million miles, makes this huge planet invisible to the naked eye, but with a telescope it will be in a favourable position to be picked up later in the evening if sufficient time and patience are used to select it from some small stars in the hind leg of the Lion.

Jupiter, apparently near the eastern border of Libra (Right Ascension 15.25), will become stationary on the 10th, then appear to move westward till it reaches a degree north of the brightest star, Alpha Libri, on 14th July. On the 15th Mercury will be at its greatest elongation, 28 degrees west of the Sun. As the Sun will reach the first point of Aries about midnight on the 21st, and the Equinox will then occur, every observer who keeps a careful note of the place on the horizon at which the Sun rises will have his east point most exactly. By noting the point where the Sun sets on the 21st or 22nd, he will be able to draw a line, say 10 or 12 feet in length, pointing exactly east and west from which his meridian, or south to north line, can be drawn at right angles. With the use of a plumb-line, it would then be possible to see when the shadow of it agrees with the Meridian, at what time it is really mid-day.

The planets Venus and Uranus will be within half a degree of one another, and will be well placed above the western horizon for an observer with telescope or binoculars, about half-an-hour after sunset on the 22nd. The part of the sky in which they will be situated is just about where Aries, Pisces, and Cetus meet. A little later Mercury will be somewhat nearer apparently to Saturn, but both will set 1 hour 12 minutes before the Sun. At 3 a.m. on the 25th, when Jupiter is on the meridian, it will be 6 degrees (length of Cross) north of the gibbous Moon.

Mercury rises at 4.12 a.m. on the 1st, and at 3.38 a.m. on the 15th.

Venus sets at 7.38 p.m. on the 1st, and at 7.28 p.m. on the 15th.

Mars rises at 8.38 p.m. on the 1st and at 7.41 p.m. on the 15th.

Jupiter rises at 10.5 p.m. on the 1st, and at 9.10 p.m. on the 15th.

3 April	● New Moon	10 11 p.m
11 „	☾ First Quarter	3 42 a.m.
19 „	○ Full Moon	7 10 a.m.
26 „	☽ Last Quarter	2 20 p.m.

Perigee, 2nd April, at 6.12 a.m.
Apogee, 14th April, at 5.48 a.m.
Perigee, 30th April, at 2.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Event and Comment.

Anzac.

WITH Australians, the Story of Anzac has grown into a great tradition, and the twentieth anniversary of the Gallipoli Landing (25th April) was commemorated with fitting ceremony throughout the Commonwealth. It is a great and inspiring story, and who has told it like John Masefield?

"On Friday, the 23rd of April, the weather cleared so that the work could be begun. In fine weather in Mudros a haze of beauty comes upon the hills and water till their loveliness is unearthly, it is so rare. Then the bay is like a blue jewel, and the hills lose their savagery, and glow, and are gentle, and the sun comes up from Troy, and the peaks of Samothrace change colour, and all the marvellous ships in the harbour are transfigured. The land of Lemnos was beautiful with flowers at that season, in the brief Ægean spring, and to seawards always, in the bay, were the ships, more ships, perhaps, than any port in modern times has known; they seemed like half the ships of the world. . . .

"Ship after ship, crammed with soldiers, moved slowly out of harbour in the lovely day, and felt again the heave of the sea. No such gathering of fine ships has ever been seen upon this earth, and the beauty and the exultation of the youth upon them

made them like sacred things as they moved away. All the thousands of men aboard them gathered on-deck to see, till each rail was thronged. These men had come from all parts of the British world—from Africa, Australia, Canada, India, the Mother Country, New Zealand, and remote islands in the sea. They had said good-bye to home that they might offer their lives in the cause we stand for. In a few hours at most, as they well knew, perhaps a tenth of them would have looked their last on the sun, and be a part of foreign earth or dumb things that the tides push. Many of them would have disappeared forever from the knowledge of man, blotted from the book of life none would know how—by a fall or chance shot in the darkness, in the blast of a shell, or alone, like a hurt beast, in some scrub or gully, far from comrades and the English speech and the English singing. And perhaps a third of them would be mangled, blinded or broken, lamed, made imbecile or disfigured, with the colour and the taste of life taken from them, so that they would never more move with comrades nor exult in the sun. And those not taken thus would be under the ground, sweating in the trench, carrying sandbags up the sap, dodging death and danger, without rest or food or drink, in the blazing sun or the frost of the Gallipoli night, till death seemed relaxation and a wound a luxury. But as they moved out these things were but the end they asked, the reward they had come for, the unseen cross upon the breast. All that they felt was a gladness of exultation that their young courage was to be used. They went like kings in a pageant to the imminent death. As they passed from moorings to the man-of-war anchorage on their way to the sea, their feeling that they had done with life and were going out to something new welled up in those battalions; they cheered and cheered till the harbour rang with cheering. As each ship crammed with soldiers drew near the battleships, the men swung their caps and cheered again, and the sailors answered, and the noise of cheering swelled, and the men in the ships not yet moving joined in, and the men ashore, till all the life in the harbour was giving thanks that it could go to death rejoicing. All was beautiful in that gladness of men about to die, but the most moving thing was the greatness of their generous hearts.

". . . . They left the harbour very, very slowly; the tumult of cheering lasted a long time; no one who heard it will ever forget it, or think of it unshaken. It broke the hearts of all there with pity and with pride; it went beyond the guard of the English heart. Presently all were out, and the fleet stood across for Tenedos, and the sun went down with marvellous colour, lighting island after island and the Asian peaks, and those left behind in Mudros trimmed their lamps, knowing that they had been for a little time brought near to the heart of things."

To-day the pilgrim's eyes are on the dimly purple peaks of Samothrace and his thoughts are with Rupert Brooke, and those who fought and died with him:

. . . These laid their world away; poured out the red
Sweet wine of youth; gave up the years to be,
Of work and joy, and that unhoped serene
That men call age; and those who would have been
Their sons, they gave their immortality.

Certificated Milk.

OPENING a certificated dairy near Brisbane in the course of the month, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that the certification of a dairy meant that there must be continuous attention to details of dairy hygiene and a considerable amount of expenditure in time, money, and labour.

Milk, remarked the Minister, was greatly depreciated in value if it contained foreign bodies, and certification placed milk beyond suspicion. In America certificated milk allowed of a bacterial count of 10,000 organisms to the cubic centimetre, but the milk supplied by the dairy he was opening officially contained only 4,000 organisms to the cubic centimetre. One of the major pathological problems associated with milk supply was tuberculosis, and, though the medical profession declared that cases of bovine tuberculosis in adults was rare, 5 per cent. of tuberculosis amongst children was bovine in origin. The solution of that problem was the exclusion of tubercular cows from herds supplying milk for domestic purposes. In a certificated dairy every cow must measure up to the health standard laid down by his department; every animal was certified to be free from major disease.

"I hope," said the Minister, "that the time is not far distant when we shall see many certificated milk carts on the streets of Brisbane. Certificated milk is guaranteed above suspicion by the State and the medical services of the State. It is a scheme that should appeal to parents, and particularly to parents of delicate children. There is no food that can take the place of milk with its admirable food balance and vitamin content."

That afternoon's ceremony was an occasion to which he had looked forward for three years, declared Dr. D. Gifford Croll, a member of the State Animal Health Board. Mr. Bulcock was to be congratulated on being the Minister to inaugurate the scheme. It had been demonstrated that pure milk could be sold at no higher a price than that ruling for other milk and at no great capital outlay.

A Model Dairy.

THE white bails of the model dairy opened by Mr. Bulcock have sloping concrete floors that are kept scrupulously clean throughout the time that the cows are being milked. Surrounding this building are lawns and sweeping gravelled drives. When the cows are driven into the bails a boy, who does none of the milking, wipes the flanks and the udder of each cow with a dry cloth, and then wipes each udder with a damp cloth suitably disinfected. The milk, after being drawn, is cooled to a temperature of 45 degrees, claimed to be the ideal temperature for delivery. To preserve the temperature special insulated cans—constructed on the principle of a thermos bottle—are used on the carts to ensure the delivery of the milk at a temperature not higher than 50 degrees, thus preserving quality. These carts, to which special attention was drawn by the Minister, are painted white, with a broad blue band—the badge of a certificated milk cart. Each of them is fitted with a special metal covering over the taps to prevent dust contamination. Night and day the members of the dairy staff wear special washing uniforms, and they are compelled to wash their hands in disinfectant after each cow has been milked, and the roller towel which they use must be changed after every twelve cows.

The Brown Vegetable Weevil.

By ROBERT VEITCH, B.Sc. Agr., B.Sc. For., F.R.E.S., Chief Entomologist.

THE brown vegetable weevil is a comparatively recent arrival in Australia, but in the last few years it has become firmly established in Queensland, each year witnessing a steady increase in the infested territory. It has a very wide range of host plants, those most favoured being potatoes and tomatoes, although it also shows a marked partiality for tobacco seedlings, carrots, beans, lettuce, turnips, parsnips, cabbages, and cucumbers. Flowering plants such as the chrysanthemum and the cineraria are also attacked, while cape weed is one of the favourite weed host plants. The destructive activities of this species are manifested mainly in the winter and spring months in this State, both the larvæ and the adults feeding on the selected host plants, the attack by the beetles being more serious than the larval infestation.

Life History and Habits.

The weevil (Plate 166, figs. 4 and 5) is one-third of an inch in length and is a greyish-brown beetle possessing two obliquely placed greyish white patches on the back which form a distinct V-shaped mark. The eggs laid by the beetles in autumn and early winter hatch into legless larvæ, which at first feed only on one surface of the foliage, generally the under surface. As they grow, however, irregularly shaped holes are eaten in the leaves (Plate 166, fig. 6). A feature of the infestation is that the larvæ which shelter during the day characteristically feed at night, although a few may be seen feeding in sheltered spots on plants in the daytime. The full grown larva (Plate 166, fig. 1) is pale green with a brown head and measures roughly one-third of an inch in length, an important feature being the presence on the head of short dotted darker lines which serve to distinguish this larva from that of another somewhat similar species. The full grown larva pupates in the soil in an earthen cell (Plate 166, fig. 2), wherein it transforms to a pale green pupa (Plate 166, fig. 3), which eventually gives rise to a typical weevil possessing a long downwardly protruding snout. The beetles shelter in the soil by day and feed voraciously by night on the foliage, generally leaving only the leaf stalks when they are at all numerous, although even these may be destroyed. The bulbs of carrots and turnips (Plate 166, fig. 7) may also be attacked.

Control.

When infestation occurs on potatoes spraying or dusting with arsenate of lead will be found effective against this pest. However, the arsenate of lead sprays or dusts generally cannot be directly applied for the control of the brown vegetable weevil because most of its host plants would then carry undesirable spray residues on the parts to be used for food. Furthermore, in the case of tobacco seedlings many of the young plants would have so much foliage destroyed before the larvæ or beetles obtained a lethal dose of the arsenical that they would be severely weakened or even succumb to the attack; hence for the control of brown vegetable weevil the general practice is to employ a type of baiting by using foliage of cape weed or tops cut from tomatoes or other attractive plants that have passed the productive stage. These

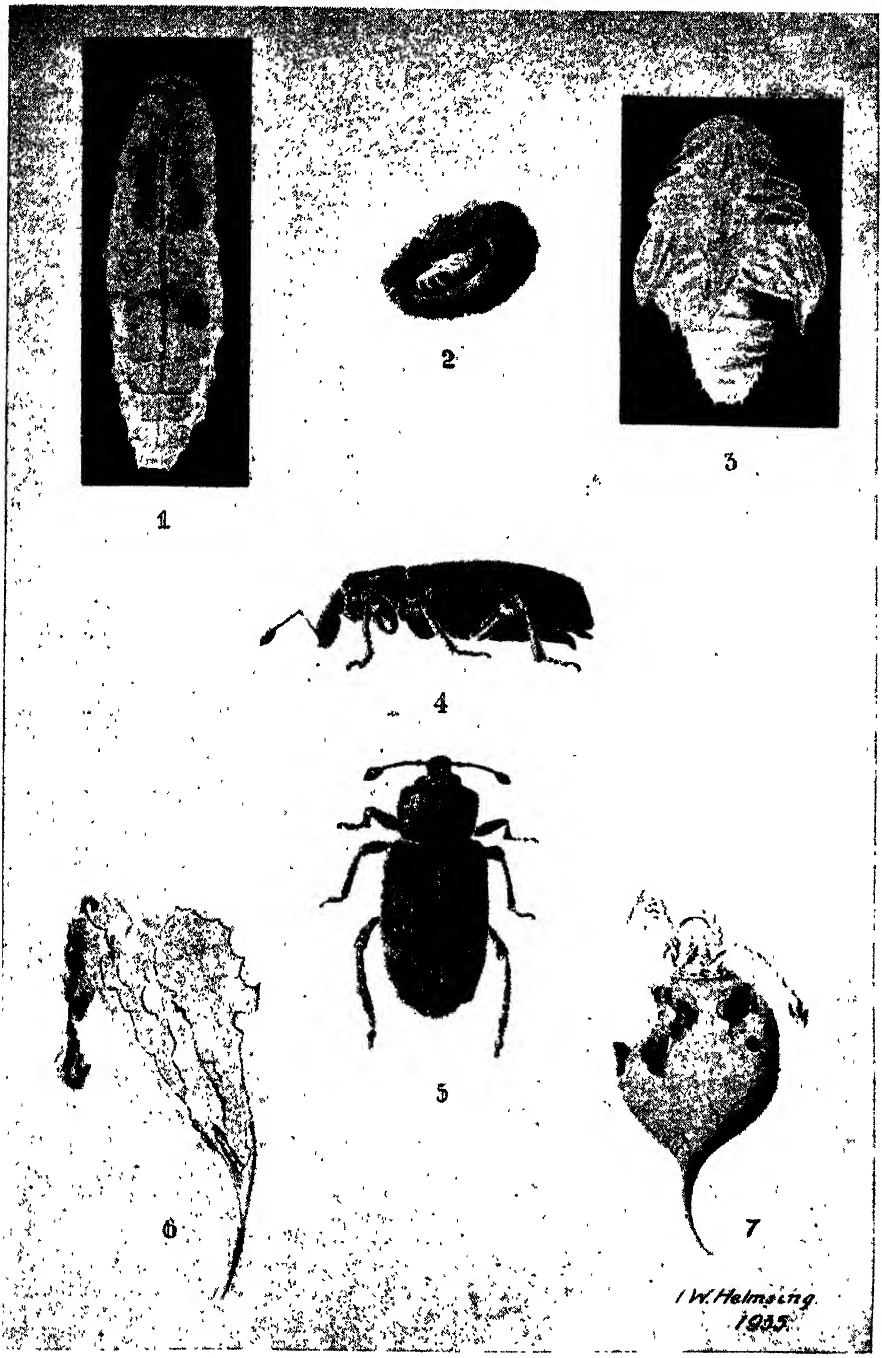


PLATE 166.
BROWN VEGETABLE WEEVIL.

Fig. 1.—Larva × 4½.
Fig. 2.—Pupa in earthen cell, natural size.
Fig. 3.—Pupa × 4½.
Fig. 4.—Adult, lateral view, × 4½.
Fig. 5.—Adult, dorsal view, × 4½.
Fig. 6.—Damage to young lettuce plant by larvæ, half natural size.
Fig. 7.—Damage to white turnip by adults, half natural size.

should be dipped in an arsenate of lead solution and placed between the rows of plants requiring protection or placed in the vicinity of seed-beds suffering from infestation. As in the case of cutworm baits these succulent tops for the control of the brown vegetable weevil should be distributed in the late afternoon so that they will be fresh and attractive when the beetles and larvæ commence feeding at night. Should it be impossible to obtain the tops for this type of bait it is suggested that growers might use the bran bait employed for cutworm control, although it is not expected that the bran bait will give such good results against brown vegetable weevil. The destruction of weeds and rubbish in which the beetles may shelter during the summer months in the vicinity of cultivated areas or seed-beds should be productive of much good, the cleaning-up being done before the beetles go into the inactive summer stage. Should heavy breeding be taking place on weed host plants in the vicinity of cultivated host plants it is probably worth while to spray or dust the weed host plants with arsenate of lead, thereby destroying many brown vegetable weevils which would probably migrate to the cultivated plants at a later date. A further control method that is worthy of consideration is the cultivation of infested land during the winter and early spring months when many of the brown vegetable weevils are in the soil in the prepupal or pupal stage at a depth of 1 or 2 inches below the surface. Such cultivation of infested land not then under profitable crops should lead to the destruction of many pupæ and prepupæ, thereby greatly reducing the number of beetles emerging in the spring months. The exact time of the ploughing should be determined after an examination of the soil to ascertain the extent to which pupation has taken place, the operation being most effective when the maximum number of pupæ and prepupæ are present

PASPALUM—ADVANTAGES OF TOP-DRESSING.

Top dressing ploughed paspalum pastures with fertilizers has been found very beneficial, and is also recommended where ploughing is impossible, but the use of the paspalum cultivator is practicable. The use of fertilizers, such as superphosphate, stimulates the growth of grasses and legumes, and the amount of mineral matter in the plants is increased, particularly the elements lime and phosphorus, which are essential for the animal's development.

Ground carbonate of lime at the rate of 10 cwt. per acre applied in the autumn of every third year and 2 cwt. superphosphate per acre each year is recommended for the top dressing of paspalum pastures. The superphosphate should be used in two dressings—1 cwt. in the autumn and the remainder in the early spring.

Unploughed paddocks to be top dressed must first be fed down closely, raked or harrowed to remove dead grass and other rubbish, and the matted crown of the grass should then be torn by the use of suitable grass cultivators or grass harrows. It is useless to apply fertilizer until the matted surface is properly opened up.

At a number of centres in north coast district, on country where it is impossible to plough, good results are obtained from top dressing paspalum as detailed above. The first application of the fertilizer should be made after working the area with a special grass cultivator, or paspalum renovator, and preferably following a good fall of rain.

A harrow, preferably a tripod and chain harrow of good penetrative power, should be used frequently on the pasture to break up and spread the animal droppings, and also create a mulch on the surface soil.—A. and P. Notes, N.S.W. Dept. Agric.

The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

DURING the past thirty years the rain-forest timbers of North Queensland have been spasmodically felled and used chiefly for ordinary structural building work. Their real value is now better appreciated both in Australia and overseas, and many commercial species with an attractive pattern are to-day chiefly used in the manufacture of veneer or as important elements in the indoor panelling favoured by modern tastes. Suitable woods for these purposes are not common, and the steady demand for some species has forced prices up to a level at which wastage of any kind is a significant loss to the manufacturer. This is particularly true of mills which cut veneer, for heavy overhead expenses are incurred by the installation of elaborate machinery and the additional handling charges essential to its operation. Much of this wastage can normally be ascribed to wood-boring insects. Those species which only penetrate the sap wood may not be of any great importance, for the heart wood in a log invariably yields the most valuable veneer. The Platypodid beetle, *Crossotarsus grevilleæ* Lea, may, however, tunnel through both sap and heart woods to completely destroy logs which would otherwise be valuable for veneer purposes. This insect has therefore been studied in some detail. A progress report has already been published (Smith, 1932), and the present paper discusses the problem in the light of recently acquired information.

SYSTEMATIC POSITION, MORPHOLOGY, AND DEVELOPMENT.

Though the genus Crossotarsus is an important element in the family Platypodidæ, insects in it are less familiar than those of the type genus Platypus, representatives of which are much larger and more conspicuous. For the most part, Crossotarsan insects are small, all the known Australian species being less than 4 mm. in length. Their habits have been little studied. Froggatt (1927) mentions four species, *C. armipennis* Lea, *C. sub-pellusidis* Lea, *C. mniszechi* Chap., and *C. cavifrons* Blndf., the last two being originally described from the Malay Archipelago. With the exception of *C. armipennis* all these have been recorded from Queensland localities, and together with *C. grevilleæ* comprise the four known species in the State.

The genus has not attracted much attention from economic entomologists and few details are available for individual species. *C. armipennis* is said to be frequent on logs of the spotted irongum, *Eucalyptus maculata,* in New South Wales, but its recorded habits differ from those of *C. grevilleæ*. In North Queensland rain forests, *C. grevilleæ* is the only species in the genus of any importance, and it does not stray far from the peculiar conditions associated with the rain-forest environment.

Crossotarsus grevilleæ Lea (Plate 167, figs. 8-10) was originally described in 1914, and the description is reproduced (Proc. Roy. Soc. Vict. XXVI., p. 226, 1914) below:—

"Flavous, in part dark brown or castaneous. Head, tips of elytra and legs with rather long, sparse, pale hairs."

"Head flattened in front with some small punctures and a feeble median carina. Prothorax slightly longer than wide, sides rather strongly curved near the apex and thence gently inflated to near the base with few small but rather clearly defined punctures about the base. Interstices with small punctures, suture triangularly notched about the apex, extreme apex irregularly vertical and with several small conical-tipped projections. Length 2 mm.

"Distinguished from other Platypodids by the small size. Of two specimens examined, one has head, except mouthparts and pronotum, black. Its elytra from about the middle are castaneous but about the apex become almost black. The others have the dark parts much paler. In both, the club is infuscate.

"Host—Silky oak, *Grevilleæ robusta.*

"Locality—Queensland, C. French, junr."

In a subsequent communication after examining material from North Queensland, Lea wrote—"He (*i.e.*, French), obtained many from logs of the silky oak from Queensland, but only females" and "The male has a long process on each side of the head (Plate 167, fig. 8), and I think that the species will have to be transferred on that account to Diapus." Lea's untimely death in 1932 has prevented the complete elucidation of the systematic aspects of the problem, but the further study of the insect as an important factor in forestry losses has yielded some relevant information.

In the first place the disposition of the sexes assumed by the original description follows Chapius (1866) and is erroneous. In common with most Platypodids, the sexes (Plate 167, figs. 8-10) are morphologically distinct, being distinguishable by differences in size, in elytral pattern, and the structure of the head. Outside the log, these can be separated as follows:—

(*a*) Size, 2 mm.; apex of the elytra ornate; elytra with a castaneous tinge merging into black at the margins;

(*b*) Size, 2·5 mm.; apex of the elytra simple; elytra uniformly black in colour; mandible with a large sickle-shaped appendage projecting forwards.

These two forms subsequently share the one burrow, and field evidence indicates that the former of these is the male and not the female as hitherto supposed. This conclusion is inferred from various data, the chief contributing points being:—

(*a*) In the Platypodidæ, morphological distinctions between the two sexes are usually very marked. In most of the better known species, the larger form with simple elytra is the female, while the smaller with ornate elytra is the male. In the two comparatively large species, *Platypus australis* Chap. and *P. omnivorous* Lea, such is very definitely the case. Similar considerations should therefore apply to *C. grevilleæ.*

(*b*) The elaboration of the burrow system is discussed later in this paper. The smaller insect initiates the burrow, but is later joined by the larger form, the joint tenancy being preceded by a change in position outside the burrow. The larger insect subsequently occupies the interior

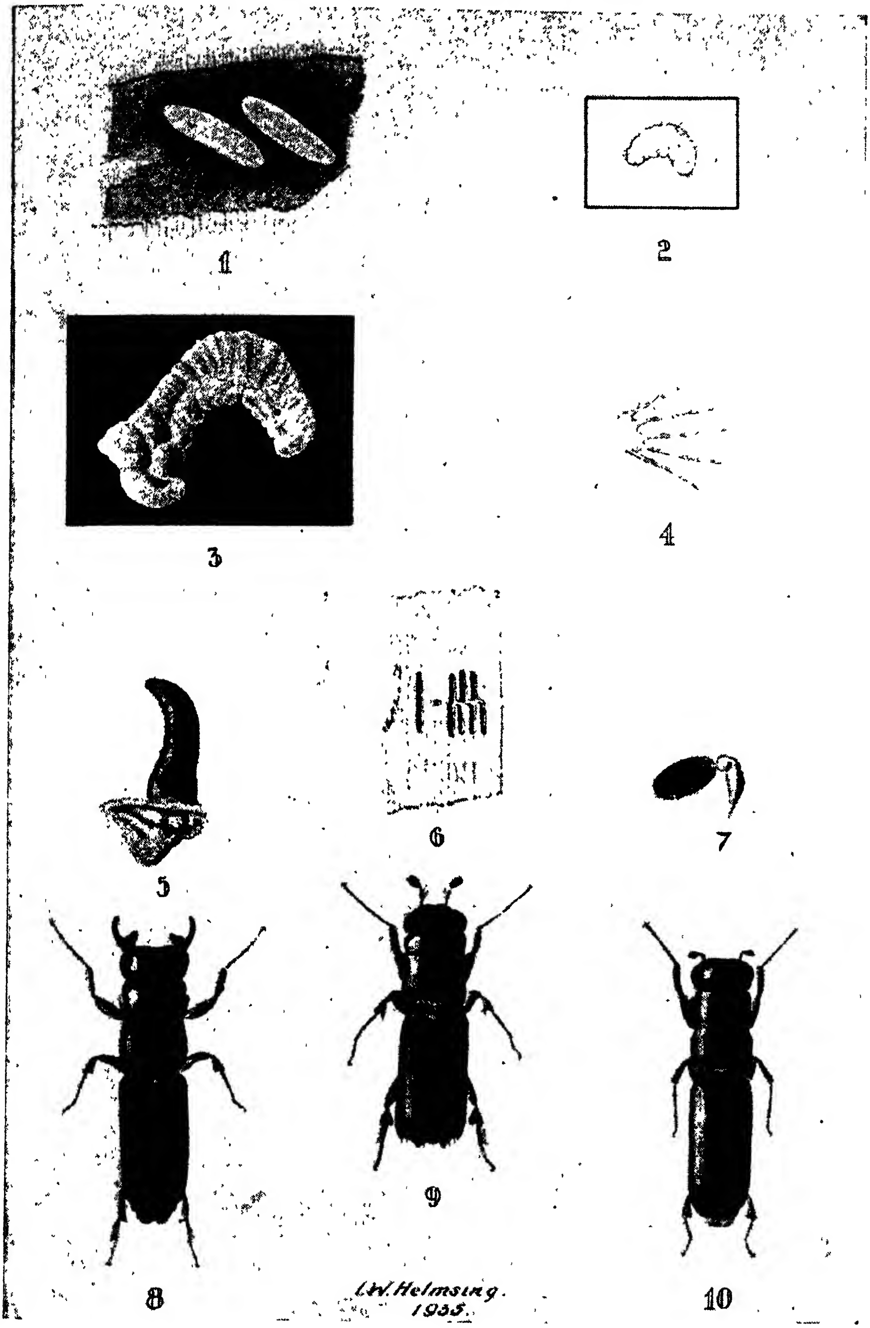


PLATE 167.

PIN HOLE BORER (*Crossotarsus grevilleæ* Lea.).

Fig. 1.—Eggs × 34.
Fig. 2.—First larval instar × 15.
Fig. 3.—Larva × 15.
Fig. 4.—Feathered setæ × 120.
Fig. 5.—Mandibular appendage × 60.
Fig. 6.—Pupal chambers, natural size.
Fig. 7.—Antenna × 60.
Fig. 8.—Adult female before boring × 15.
Fig. 9.—Adult male × 15.
Fig. 10.—Adult female after boring × 15.

of the burrow system. When the first batch of eggs is laid, no transposition of insects within the burrow is possible, and one must assume that the large form in the interior is the female on account of its egg-laying capacity.

(*c*) Miscellaneous material collected in the rain forest failed to reveal eggs or details of the sex in the two forms on dissection, largely because the separation of the internal organs of such a small insect is a difficult matter. The more careful selection of adults from burrows where egg-laying was known to be imminent facilitated the location of eggs, which were ultimately found in the internal organs of the larger insects only.

The biological data thus indicates quite definitely that of the two morphologically distinct forms, the smaller is the male and the larger the female.

Shedding of Mandibular Appendages.

Outside the log, the female possesses two forwardly projecting appendages, one attached to each of the mandibles. They are perfectly rigid, about three times the length of the mandibles and attached to the thicker basal portion. They have a sickle contour, and the inner edge is serrated, while the outer is quite smooth (Plate 167, fig. 5). The functional utility of these structures, if any, is unknown, and once the female takes an active part in the extension of the burrow system, the appendages are shed (Plate 167, fig. 10). The attachment between mandible and appendage is very secure and separation can be effected in the laboratory only with difficulty. Occasionally females are found in which one appendage has been shed while the other remains intact, suggesting that burrowing has been commenced but interrupted by predators before both have become detached. The line of the break is to be seen on the rugose anterior face of the mandible of the appendageless female.

Morphology of Immature Forms.

The immature stages have few distinctive features. The eggs (Plate 167, fig. 1) are white, elongate oval in shape, and taper slightly at one end. They are ·4 mm. in length. Within a month of the association of the sexes in the burrow, eggs are laid singly or in groups at the end point of the burrow system. The incubation period during the summer is less than one month, and eggs may be laid over an observed period of twelve months at different levels of the wood, depending on the ramifications of the burrow system.

Larvæ when first hatched (Plate 167, fig. 2) are somewhat barrel-shaped in dorsal aspect, though recurved in lateral view. Towards maturity, the three thoracic segments expand, the development of the prothorax being particularly great (Plate 167, fig. 3). The dorsum of the prothorax in the mature larva has looped chitinous areas which doubtless facilitate the movements of the insect. Mature larvæ are 4 mm. in length and the colour throughout is milk white. Semi-mature and mature larvæ are devoid of distinct setæ and thus contrast with recently hatched forms. The latter are richly setose, single setæ being regularly distributed over the body. On the dorsum of the third abdominal segment, a series of peculiar feathered setæ (Plate 167, fig. 4) occur in a transverse line, each being mounted on a small tubercle. These setæ in common with the rest clothing the body may be absent in older larvæ on which setæ persist, if at all, in truncated form.

The number of instars is largely conjectural as the larvæ cannot be observed during successive moults. Head capsule measurements, however, fall into two groups with mean widths of ·26 mm. and ·52 mm. The first group includes all the smaller forms examined, but in the second the larval lengths may vary from 1·5 mm. to 4 mm. If Dyar's hypothesis concerning the geometrical increase in head capsule size from instar to instar is applicable to this insect, two instars will be represented. Possibly an earlier instar with head capsule measurements consonant with the width of the egg can be built into the series, making a three instar development of the larvæ. This conjectural first instar has not been observed, and its duration, should it exist, must be very short.

Pupæ (Plate 168, figs. 1-4) are to be found in groups of parallel chambers (Plate 167, fig. 6) on both sides of a burrow, the number of chambers in any group varying from one to as many as fifteen. Each chamber holds a single pupa. The sexes can be distinguished at this stage by their respective lengths and the presence or absence of mandible appendages. The body colour is at first white, but the more heavily chitinized portions darken at an early stage, long before transformation to the adult is complete. Pupal movements are possible owing to the flexibility of the abdominal segments.

INJURY BY AND ECONOMIC SIGNIFICANCE OF THE INSECT.

The pinhole borer, *Crossotarsus grevilleæ* Lea, is a common rain-forest species, and during the summer months the free-living adult population is relatively high. Consequently few logs reach the mill without at least some burrows initiated by the insect. Unlike the majority of allied species, the burrow system is carried right through the heart wood, and the whole of the wood tissue may ultimately be riddled by the insect. While the injury may be of no great importance for many structural purposes, it is quite otherwise in timbers used for fine work in which a flawless finish is essential. Curiously enough, the majority of the timbers attacked are particularly suited to fine work in which veneer is worked on to a plywood base. Veneer cut from pinhole borer-riddled logs has invariably to be discarded. In the preparation of veneer, the logs are usually flitched—*i.e.*, cut into sections before treatment by the veneer knife—but borer defects may not be apparent on the rough surface left by the circular saw; hence it is not uncommon for a flitch to reach the knife before its defects are noticed. The expense of special handling for veneer purposes has then to be added to the loss already involved when logs purchased as veneer quality are cut for structural purposes.

A considerable volume of timber suitable for veneer is exported in the log to overseas destinations. If the timber cuts to specifications, the expense entailed in freight and handling charges is comparatively small. On the other hand, should the logs be infested with *C. grevilleæ*, the net loss is greater than if the logs had been milled in this country. Faulty logs are thus of greater significance to the overseas than the domestic market, and importers now insist on a rigid inspection before shipment as a reasonable guarantee that only sound timber will be forwarded.

In most mills handling North Queensland cabinet woods, the yards are at times strewn with logs rejected for veneer purposes. These will ultimately be cut up and sold in less profitable ways. A number

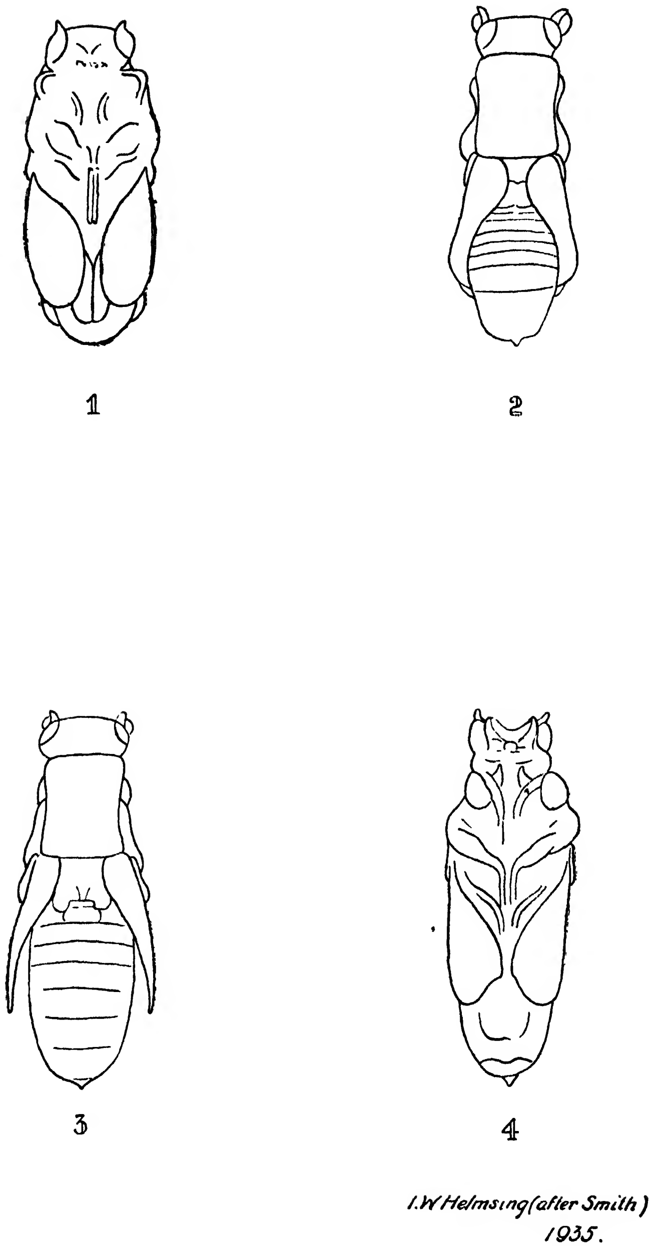


PLATE 168.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1.—Male pupa, ventral view.
Fig. 2.—Male pupa, dorsal view.
Fig. 3.—Female pupa, dorsal view.
Fig. 4.—Female pupa, ventral view.

of causes may have prompted their rejection, but pinhole infestation is a common trouble and the loss from this source is much greater than is generally supposed, particularly when the interval between felling and milling is extensive.

HOST PLANT RANGE.

The range of host plants of *C. grevilleæ* is a particularly wide one, for no commercial rain-forest species in North Queensland has been found to escape attack if placed under conditions suitable for mass infestation. The greater part of these are, of course, Angiosperms, but at least two of the millable Gymnosperms—kauri pine and brown pine—are susceptible to attack. Though timbers vary in hardness, the relative infestation of both soft and hard woods is very similar, largely because the bulk of the insects initiate burrows in the sapwood and work from thence into the heart wood. Though burrows are initiated and eggs laid by the female, the immature forms may not reach the pupal stage and the life cycle remains incomplete. Pupal chambers are the only satisfactory proof that reproduction has reached its end point in the production of adult progeny. Judged by this criterion, it must be concluded that burrow initiation, though invariably followed by egg deposition, commonly fails in its main purpose—*i.e.*, the propagation of the species. In spite of this, the prodigal distribution of suitable breeding material under conditions favourable to mass infestation is such that the Crossotarsan population is maintained at a comparatively high level.

The following Angiosperms are host plants of this pinhole borer:—Black bean (*Castanospermum australe*), canary ash (*Beilschmiedia Bancroftii*), canary sassafras (*Daphnandra micrantha*), maple silkwood (*Flindersia Brayleyana*), northern silky oak (*Cardwellia sublimis*), nutmeg (*Meristica indica*), penda (*Xanthostemon pubescens*), red cedar (*Cedrela australis*), red tulip oak (*Tarrietia perilata*), rose butternut (*Blepharocarya involucigera*), satin sycamore (*Ceratopetalum Virchowii*), scrub turpentine (*Canarium Muelleri*), silver ash (*Flindersia Bourjotiana*), spur mahogany (*Dysoxylon Pettigrewianum*), silver basswood (*Panax Murrayi*), walnut bean (*Endiandra Palmerstonii*), water gum (*Eugenia gustavioides*), white cheesewood (*Alstonia scholaris*), white quandong (*Elæocarpus grandis*), white silkwood (*Flindersia acuminata*).

The only Gymnosperms so far recorded as host plants are:—Kauri pine (*Agathis Palmerstonii*), brown pine (*Podocarpus amara*).

[TO BE CONTINUED.]

An Introduction to Beekeeping.

By HENRY HACKER, F.R.E.S., Entomologist.

[*Continued from p.* 367, *April Issue.*]

SECTION V.—GENERAL MANAGEMENT OF BEES.

Stings.

THERE would probably be many more people keeping bees than at present, were it not for the natural fear of stings, but as their habits become better understood this fear disappears almost entirely. A bee-sting is constructed with minute barbs on its spear-like tip, which prevent the bee from withdrawing its sting rapidly, with the result that the poison bag is torn out and left attached to the sting. The mutilated bee flies away but always dies after a few hours. The sting with the attached poison bag should be withdrawn by a scratch with the finger nail, and a puff of smoke on the place will disguise the smell of the sting poison which irritates the bees. The first sting, which is a warning of others to follow, should be carefully avoided. Quick movements tend to irritate bees, and novices on approaching a hive should avoid striking at the insects which happen to fly towards them, or making other quick movements of the head or hand to avoid the dreaded sting. This rapid movement alone will attract other bees, and stings are very likely to follow.

Handling Bees.

When working with a hive of bees, the beekeeper should stand at one side and not in front of the entrance, for in the latter position the flight of the bees is interrupted. Before opening the hive, blow a little smoke into the entrance and then wait quietly for a minute. This smoke disarms the entrance guards, drives them in, and occasions a sound of alarm throughout the hive, which causes the bees to fill their stomachs with honey. In this condition they are much more agreeable and, therefore, easier to handle. Next quietly lever up the cover and puff a little smoke under it to drive the bees down between the frames. The cover now being lifted, the frame nearest the operator may be loosened and taken out at will, the others being crowded together to give more room for its removal. Do not jar the frame or drop it, but lean it on end against the back of the hive out of the way, to avoid kicking it, and at the same time to prevent crawling bees from getting up one's trouser legs. The frame on which the queen is found should not be placed down outside, because of the danger of losing her. The frames should be replaced in the hive in exactly the same position from which they were taken, in order to minimise the amount of disturbance.

The best time to handle bees is during the middle of a warm sunny day when flowers are about. Never handle them at night or on cold, wet days unless in absolutely necessary preparation for moving or other operations. Bees should, indeed, not be handled unnecessarily at any time, for such disturbances always interfere with their normal activities. The use of too much smoke troubles them so greatly that they will cease work for several hours.

Clipping Queen's Wings.

Clipping the wings of each queen after she has commenced laying has several advantages. By keeping a note-book, as previously mentioned, a record of this operation may be entered and her age will be known. It is a great advantage at swarming time, as the queen is unable to accompany the swarm which will always return, and if suitable preparations have been made for its reception, it may be successfully hived.

Clipping is best effected with a pair of fine-pointed scissors. The queen should be gently lifted from the comb by grasping her wings with the finger and thumb of the right hand, which leaves her head and thorax free to be held with the finger and thumb of the left hand. The wings are then released, thus freeing the right hand for clipping the wings. Avoid handling or squeezing her abdomen, as it contains the ovaries which are sensitive to the slightest injury. Before attempting to clip a queen some practice could be obtained on a few drones until confidence is gained. The stumps of the wings should be about one-eighth of an inch long after cutting, which should be done on one side only. It is better to make the cut in a diagonal direction, leaving the thickened nervure on the front of the wing a little longer, to avoid bleeding, which may temporarily weaken the queen.

Tiering.

When the bees begin to swell the brood-combs near the top bar of the frames with new comb, or when a honey flow is just beginning it is time to put on an extracting super. This is a hive body exactly similar to a brood chamber, and is provided with drawn-out combs, or failing these, with frames containing full sheets of foundation. Most beekeepers put only nine frames in a ten-frame hive body when used as a super, because the extra space between the combs allows the bees to make thicker and more even combs, which are much easier to uncap.

If the colony is strong enough the bees will immediately take possession of the super, but should they be disinclined to go up, a frame of brood may be taken from the brood chamber and placed above, exchanging it for an empty comb, and this will usually induce the bees to commence storing honey in the super.

Many beekeepers work with a single super, but it is not the best method, as during a good flow honey is sometimes lost for lack of storage room, while if the unripe honey is removed in order to make room, trouble will occur later on through this watery honey becoming sour and fermenting.

In order to ensure that only thoroughly ripe honey is extracted, and at the same time to take full advantage of a sudden honey flow, several spare supers containing drawn-out combs are necessary. These are tiered up one above the other as they are required. When adding an additional super to the tier it should always be placed next to the brood chamber, and the others containing partly-filled or unsealed comb placed above these two.

The thorough ripening of honey cannot be too strongly recommended, and tiering should be practised, especially in the moist coastal districts, as the honey is improved both in density and aroma the longer it is kept in contact with the bees.

Strong Colonies.

One of the chief aims in manipulating bees is to build up strong colonies and endeavour to have them at their maximum strength at the time of the chief honey or nectar-flow. Observation of the local flora with a careful note of the buds showing on the various eucalypts or other trees, together with a record of the rainfalls and climatic conditions generally, are good guides in this respect. If the chief flow occurs early in the season, preparations should have been made during the previous autumn to see that each colony possessed a young queen, and that they had sufficient stores.

If two full-depth bodies packed with bees can be built up just before a nectar-flow, the bees will fill two or even three honey supers, as a young well-bred queen will easily keep two bodies filled with brood during an average season. As the consumption of stores by weaker colonies is just as great as by strong ones, and as they give less surplus honey, it is evident that a moderate number of strong colonies is a better business proposition than a larger number of weaker ones, besides requiring less work.

Feeding Bees.

It is occasionally necessary to feed bees to keep them alive sometimes after a severe winter if they have run out of stores before the spring flowers arrive, and sometimes during a drought. At other times it is advisable to feed them, perhaps not to keep them alive, but in order to procure a maximum honey crop.

Feeding is not done to make honey from the syrup fed, but to induce brood-rearing in a season of dearth, so that a vigorous colony will be available when nectar becomes abundant; otherwise brood-rearing will be so greatly reduced that the colonies will lack strength to gather a profitable crop of honey. It is often possible and cheaper, however, to move the bees into a good temporary locality to avoid feeding. After eggs are laid, six weeks must pass before the bees are old enough to gather nectar, and if a colony is short of food, few eggs will be laid. When a nectar flow begins, egg laying will suddenly increase, but the bees reared from these eggs will ordinarily not be old enough to gather much nectar before the flow stops.

When honey is not available, stimulative feeding should be done with a thin sugar syrup of a consistency similar to that of fresh nectar. The best possible artificial bee feed is made from pure white sugar dissolved in water. Two parts by volume of sugar to one of water make a satisfactory thin syrup for stimulation.

There are several types of feeders, probably the most suitable for all purposes being the Alexander feeder (Plate 144, fig. 5). To use it the hive is moved back about 2½ inches on the bottom board, and the feeder, which is the full width of the hive, is placed outside and underneath the hive at the rear. The bees consume the sugar from inside the hive, and if the feeder is fitted close to the hive the bees are protected from the attacks of robber bees. Another pattern called the simplicity feeder is used in an empty super over the brood chamber. A third type is the division board feeder which hangs in the hive like a frame, while the Boardman feeder is placed in front of the entrance to the hive.

Wintering Bees.

Owing to the genial winter climate of Queensland the beekeeper may dispense with elaborate precautions such as winter packing, chaff hives, or underground cellars, required in colder countries. Here the bees can remain on their summer stands although the spare supers should be removed, and the hive entrances contracted to about half that of the summer width. At least 30 lb. of honey should be left in each hive, and many beekeepers leave a super filled with sealed honey above the brood. This ensures an ample supply of winter stores, and any that is not consumed may be extracted in the spring when the new honey begins to come in. In a district liable to frosts a few thicknesses of newspaper folded over the top of the frames and down the outside of the combs will keep the bees snug and warm and reduce the amount of stores that would otherwise be consumed in maintaining the temperature of the colony.

Spring Cleaning.

As soon as the spring really sets in no time should be lost in going through all the hives and getting the colonies into good shape for the coming honey flow. A good practice among some experienced beekeepers, and one which may be recommended, is to commence with a clean spare hive and then transfer to it all the frames from the first hive actually in use. The hive thus emptied is then thoroughly cleaned, all the burr-comb, propolis, wax-moth cocoons, and other debris removed, after which it is ready to accommodate the frames and bees from the second colony. This change into a fresh hive is continued through the entire apiary, taking care that the original stands occupied by the colonies are not altered. The operation has a stimulative effect on the bees, to which they respond by exhibiting greater energy in carrying on their various activities. When the colonies are being overhauled any hives that are leaning should be levelled up, as this will result in straighter combs being built. The queens should also be looked for, as they are more easily found at this time than later on when the hives are more populous. Note their age, and if too old, enter the hive numbers in the note book as being among those which require requeening. A beginner will be able to distinguish an aged queen by the corrugated appearance of the outline of her abdomen, whilst in a young queen the outline of the abdominal segments presents an almost straight line.

This is the best time for clipping the queen's wings. Faulty combs, or those with a large proportion of drone cells, may be replaced with other combs or full sheets of foundation. The quantity of winter stores remaining in the hives should be noted, and where the supply is nearly exhausted feeding should be commenced, as it is essential that at this time the hives should have ample stores so that no obstacle exists to brood-rearing.

Uniting Colonies of Bees.

Sometimes the best plan is to unite weak, hungry colonies with stronger ones. Perhaps the beekeeper has on hand several weak swarms that issued late in the season, or colonies that have gone back through queenlessness or other causes. Much may be gained and nothing lost by uniting these weak colonies. The bees' knowledge of the exact position of their hives makes it necessary that colonies to be united during the active season should stand within a few feet of one another,

otherwise bees will become lost. If it is desired to unite colonies situated further apart, they may be gradually moved towards each other at the rate of 2 feet each day until they stand side by side. Each colony has its own odour which the bees recognise, so that it is necessary to guard against fighting and, perhaps, robbing. To avoid this, uniting is best performed late in the day. Both colonies are well smoked, and the combs are arranged in the new hive with a view to mixing the bees as much as possible. The brood-combs from each colony should be placed alternatively, commencing in the centre of the hive and working outwards, and the heavier combs of honey placed at the sides to fill the hive, the light or faulty ones being left out, and from these the bees may be shaken on to a large board leaning against the entrance. The bees usually take good care of the queen, but as a precaution she may be caged in the hive for forty-eight hours. If both colonies have queens it is advisable to keep the poorer one caged in the hive until it is ascertained whether the other has been accepted or not.

A more modern and simple method of uniting is as follows:—The queen of the weak colony is destroyed and the cover is removed and a double thickness of newspaper put in its place. The bottom is taken from under the other colony, which is then set on top of the newspaper cover. Thus two colonies are housed on the same stand separated only by the newspaper. The bees on both sides of the paper will immediately begin to gnaw it away, and by the time they have cut through and carried it out of the entrance, which generally occupies twenty-four to forty-eight hours, they will have acquired the same odour, and will not fight.

They need not be assisted in removing the barrier, but during hot weather it may be necessary to provide for ventilation of the colony above the newspaper. This may easily be done by pushing wooden matches in between the paper and the edge of the upper hive body, thus leaving a narrow air crack too small for bees to pass through.

Robber Bees.

Where the flow of nectar is constant throughout the working season the beekeeper will experience little or no trouble with robber bees, but should the trees which have been yielding nectar suddenly cease to do so, the bees will require careful handling. The last extracting for the season is usually marked by more or less robbing, especially if any honey has been dropped or left exposed. As bees in a natural state never see honey outside a hive, they immediately become excited and commence to fight and rob each other's hives until sometimes the whole apiary is in an uproar. The weaker colonies are the greatest sufferers, sometimes being completely robbed of their stored honey by the stronger colonies.

The avoidance of this source of loss, which is often caused by carelessness on the part of the beekeeper, lies firstly in never leaving honey, pieces of comb, or, in fact, anything that bees will rob, exposed about the apiary, and secondly, in never attempting to extract or even open the hives when the conditions are such that the bees exhibit a tendency to rob.

Swarming.

Bees swarm when the hive is full of brood and adult bees and the incoming nectar is abundant. At such times they are apt to hang out on the front of the hive for several days before swarming. The swarming

season in Queensland is long, extending from September until March, but most swarming takes place during the months of October and November. When the swarm, consisting of practically all adults in a hive, comes forth, a great deal of confusion apparently occurs. The bees fly rapidly about in an unorganised fashion, but after a few minutes, if the queen is accompanying them, the swarm becomes quieter and flies with a definite system. Before long a great mass of bees will settle of its own accord on some convenient place for further organisation. They will move again after an indefinite time, ranging from a few minutes to several hours, and will now go, perhaps to a great distance, to a hive, a house, a tree, or other suitable shelter previously located by the scouts.

Capturing Swarms.

Two methods of capturing and hiving swarms are given here; the first method is suitable for ordinary swarms where the queen bee accompanies the other bees, while the second method is the most suitable where clipping the queen's wings is practised.

When the swarm has clustered for the first time the swarming box is brought into use. This box is simply made and is a great convenience. A 3-inch ventilation hole is bored through each of two opposite sides and covered on the inside with wire gauze, and a tin slide is fitted on the outside to cover the hole and darken the box. Hold the box close under the cluster of bees, with the sliding lid pulled wide open, then jar or cut off the cluster from the object on which it is supported so that it falls into the box. Close the lid except for a space of about an inch, and stand the box down on end, with the opening at the bottom so that the remaining bees may enter. The lid is then tightly shut and the box of bees is placed in a cool place until the evening, when the bees may be transferred to their permanent quarters.

The hive is made ready to receive the swarm by placing one frame of unsealed brood in the centre and filling the hive body with frames of foundation.

When transferring the bees from the box to their new home prop up the body about an inch from the floor board, and lay a piece of bagging in front on a level with the entrance. Then give the swarm box one or two sharp jerks, open the lid, and pour the bees out on the bagging.

The surplus brood-combs from the colony which has given off the swarm may now be disposed of, for it is generally considered unprofitable, in the case of apiaries carrying their full complement of hives, to attempt to once more build up the parent colony except in the case of very early swarms. The combs will have a number of queen cells attached, and if the bees are of a good Italian strain it is desirable to save them. The combs containing these queen cells are simply placed on top of the parent colony, over a queen excluder, until the cells are ripe. These ripe or sealed queen-cells may then be detached and used in the apiary. If there are any weak colonies in the apiary, the body of brood-combs, after the removal of the queen-cells, should be given to one of them as a super, and it will strengthen it wonderfully.

As previously mentioned, it is a good plan to clip the queen's wings in order to prevent the possibility of the swarm flying away; this should be done during an examination of the colonies in the early spring before

the bees become numerous enough to make it difficult to find the queen. When clipping is practised the grass around and for some distance in front of the hives should be kept short during the swarming season, and someone should be present in the apiary to attend to the swarm when it emerges, and to pick up and cage the queen before the ants find her. She will probably be seen in the grass in front of the hive entrance, and when caged should be placed in a shaded and safe place—the pocket for convenience. The apiarist should get quickly to work and select a frame of brood containing some eggs and larvæ. This is then put in the prepared hive, in the centre of frames containing full sheets of comb foundation. If desired, this brood can be taken from the parent colony, providing there are no queen-cells on the comb. Next remove the parent colony and place the newly prepared hive on the stand that was occupid by the parent colony, with the caged queen at the entrance. The flying swarm will soon discover that their queen is not among them, and will return to what is now the prepared hive. The queen can be liberated when the bees settle down, which will be about one hour later. The surplus brood-combs from the parent colony may be disposed of as previously mentioned.

Swarm Control.

Swarming is a natural instinct brought on by the surrounding conditions, which may be controlled to some extent by the beekeeper. The following manipulations tend to reduce swarming:—(1) The introduction of young queens, preferably the progeny of queens whose colonies are not disposed to swarm. (2) The prevention of crowding in the brood-chamber previous to the honey-flow by the use of good worker-combs, to reduce the number of cells unavailable for worker eggs, also by the removal of combs of brood, which are replaced by empty combs or sheets of foundation to relieve the congestion. (3) The removal of queen cells soon after they are started, since, if queen-cells are well advanced, their removal is not so effective in preventing swarming. This usually requires an examination of the brood-chamber once in seven to ten days. (4) Excessive heat within the colony, another potent factor in swarming, may be reduced by using a shade board and increasing the opening for better ventilation.

Requeening.

The queen, being the mother of the colony, is by far the most important bee in the hive. Should she die, leaving no young worker larvæ from which another queen can be raised, the colony will dwindle away unless another queen be given to it. A queen may prove unsatisfactory and require replacing for several reasons. She may be a worthless drone breeder, or she may be unprolific. Furthermore, the prolificness of a queen usually diminishes rapidly after her second year, and she then fails to maintain the large population necessary for harvesting a maximum honey yield. Another common reason for requeening is a desired change in the race of the colony from black or hybrid bees to Italians. If the Italian queen has been mated with a pure Italian drone all the bees in the colony will be pure Italians as long as the queen remains alive.

Before requeening, the first thing to do is to catch and kill the old queen, otherwise the fresh one will undoubtedly be killed. The usual practise is to lift out the combs one by one and examine them until

the queen is found. It is handy to have a spare body near the hive so that the frames, as they are examined, may be placed therein; otherwise while one comb is being examined the queen may pass from an unexamined comb to one that has been examined and replaced, and she will be missed. If all combs have been examined and the queen not found, carefully examine the floor board and sides of the hive, then re-examine the combs as they are replaced.

The old queen having been disposed of, the usual method is to leave the hive queenless for a day. The following day the queen is introduced to the hive from the mailing cage (Plate 144, fig. 3) in which she was received through the post or in a similarly shaped wire gauze cage called an introducing cage (Plate 144, fig. 1). The cork or corks in the cage and one frame from the hive are removed and the mailing cage is then wedged in the centre between the remaining frames. In the course of a few days the bees in the cage and those outside eat away the candy and the queen is released. By this time she will have the scent of the hive, and will be accepted.

Another method which has been recommended by those who have used it with complete success is the paper bag method. Take a small, thin paper bag, such as is used for lollies, place the queen to be introduced therein, without any of her attendant bees, then catch half-a-dozen bees from the hive and place them in the bag with her. These bees should, if possible, be young, and filling themselves with honey from the cells when caught. Although the queen is strange to them, they will be so busy trying to get out that they will not take any notice of her, and in the meantime they will all acquire the same scent. Remove one frame and place the bag in the hive between the frames, and in the course of a few hours the queen will have been released and accepted. The advantage of this method is that there is no need to leave the hive queenless for a day. One may open the hive, destroy the old queen, and introduce a new one in a paper bag straight away with considerable success. Whichever method is adopted, the hive should not be disturbed for about three days, after which time it should be opened to see that the queen is all right.

Supersedure.

Bees generally supersede queens in their third year, or those which are failing during their second. The latter may still be fairly prolific, but by some means the bees know that they would not live through the coming winter, and that it is necessary to raise successors while drones are still flying. The queen cells which bees construct when superseding are few, rarely more than one or two. They are generally built on the face of one of the outer combs, often a brood comb, as in the case of swarm queen cells. Supersedure cells must not be mistaken for swarm cells and destroyed, or the hive may eventually become queenless.

Artificial Increase.

In remarks on swarming the well-established beekeeper was advised to break up the parent colony after the issue of a swarm. The reader may thus perhaps wonder how a beekeeper can increase his apiary should he desire to do so. A strong colony can, of course, be divided into three or four nuclei, but doing this probably destroys all chances of securing a crop of honey, and at the same time is almost sure to cause some brood to die.

The following plan, known as the Alexander method, avoids all loss of brood through chilling, and at the same time enables one to make a moderate increase as well as to secure a honey crop.

When a colony is nearly full enough to swarm naturally, and the beekeeper wishes to make two from it, he lifts it from its stand and puts in its place a hive containing frames of comb or foundation just as he would prepare a hive for a swarm. The centre comb is removed from this new hive, being replaced by a frame of brood from the old hive. It is important to see that no queen cells are present in the comb, the next step being the liberation of the queen from the old hive on this brood comb. Then a queen-excluding honey-board is placed on top of the new hive which now contains the queen, a frame of brood and empty combs. The full queenless old colony is then placed over the excluder, and, after filling the space left by the removal of the brood comb with the comb previously taken from the new hive, the upper hive should be closed except for the entrance the bees have through the excluder into the hive below. They may be left in this way for about five days, then the frames should be carefully looked over, and if any larvæ are found in queen cells, the two hives had better be separated at once. This premature separation will give two colonies, but a certain amount of brood will be chilled. If, however, the bees have not started any queen-cells above the hives may be left together for ten or eleven days, during which time the queen will have a good amount of brood started in the lower hive, and every egg and larva that was in the old hive on top will be capped over and saved. The two hives may then be separated, the old hive being placed on a new stand. It will then be full of young bees and capped brood, and in about twenty-four hours they will accept a ripe cell, a virgin queen, or a laying queen, as they will then realise that they are hopelessly queenless. If possible a laying queen should be given, as full colonies should not be without a laying queen a day longer than is necessary.

By this method two strong colonies may be obtained from one without losing any brood or checking the laying of the queen, and these colonies are not likely to swarm during the remainder of the season.

The few failures with this method have been due to dividing colonies that had already made some preparation for swarming by having eggs or larvæ in their queen-cells. In some cases the colonies have actually been divided when they had capped queen-cells in their hives at the time the queen was put in the new hive, and, of course, they swarmed in a day or two, which illustrates the need for observing the state of the colony to be manipulated.

Rearing of Queens.

At the end of the first section of this article it was pointed out that queens lay more eggs during the first year than in any other, after which the number of eggs laid gradually diminishes until the queen is replaced. Every beekeeper knows that, other things being equal, the greatest amount of surplus honey is produced by the numerically strongest colony. It follows, therefore, that in order to maintain a colony at its maximum strength the queen should be replaced by a younger one at least every two years.

Writers on this subject have made various estimates regarding the number of colonies a beekeeper should possess before he attempts queen rearing. One authority mentions fifty colonies, another one hundred

colonies, while a third recommends a commercial beekeeper not to attempt to rear his own queens, but to concentrate all his efforts on honey production. Very good untested queens can be purchased in this State for five shillings, but this charge, although small for one or two colonies, reaches a formidable total when multiplied by a few score.

It will, of course, be necessary for the average beekeeper to buy some queens in order to obtain good breeding stock. Furthermore the beginner can scarcely expect to rear good queens during the first year, and no one can hope to do so until he becomes well acquainted with the habits of bees.

The three impulses under which a colony will rear a queen under natural conditions are swarming, supersedure, and queenlessness, and in rearing queens by the so-called artificial methods it is necessary to follow rather closely one of these three. In practice the beekeeper can take queens from normally constructed queen-cells. By making the colony queenless a considerable number of these will be reared, and by very careful watching almost all of them may be captured and caged before they kill each other or destroy the other cells. To do this, however, it is necessary to look over the entire colony frequently each day for several days. This plan is not to be recommended except where it is impossible to use some of the better methods.

Saving Natural Queen-Cells.

During the swarming season the beekeeper can often obtain a number of fine queen-cells by taking queen-cells from colonies preparing to swarm, provided the parent queens are of satisfactory stock. By placing these in colonies to be requeened, after the removal of the condemned queens, requeening takes place naturally without further manipulation. Making a colony queenless early in a honey-flow costs less, perhaps, than a period of queenlessness at any other time, in that the eggs laid are not of value as future honey-gatherers. Furthermore, this may often be done in connection with dequeening to control swarming. By keeping a watch for opportunities to utilise good, natural queen-cells, time may be saved by reducing the amount of artificial queen-rearing.

Building Natural Queen-Cells.

For convenience the alley method of queen-rearing has much to commend it. A strip of comb is cut out just wide enough to contain one complete row of cells containing eggs. This is then cut down by removing about two-thirds of the walls on one side. With a match or small stick two in every three eggs are destroyed, leaving the cells empty. This strip of comb is now fastened to the lower edge of a 2 or 3-inch strip of empty comb attached to the upper part of a frame, the eggs remaining being pointed downwards. This prepared frame is now given to a queenless colony from which all young unsealed brood has been removed. The workers remodel the cells which contain the eggs, making them into queen-cells.

Queen-Cells on Artificial Bases.

To have the queen-cells in more convenient shape for handling, Doolittle artificial cell-cups are prepared by dipping a smooth stick with rounded end into melted wax and removing the adhering wax.

Another and more popular method is to use wooden cell-bases. A short cylinder of wood is hollowed out on one end and lined with wax, the cavity being the size of a queen-cell base. These wooden cell-bases are fastened to the underside of moveable wooden bars in the cell-raising frame.

Transferring Larvæ.

Having made the necessary cups or bases they are inverted, and the usual practice is to wipe the inside of the cell with a little royal jelly procured from another queen-cell. Young larvæ are now carefully lifted from the worker-cells and placed in the artificial cell-cups, being taken, of course, from the colony of the queen selected as best for breeding. The supplied cells are hung in a normal colony prepared for cell-building. The larvæ chosen should be as young as they can be obtained, preferably not more than one day from the egg. Older larvæ may be used but the resulting queens will probably be less valuable.

After cells have been accepted, *i.e.*, the worker bees have commenced to draw them out, they should be transferred to a second strong colony and placed in the upper story which is protected by perforated zinc to keep the queen from destroying the cells. If there is no honey flow it is necessary to give the colony some sugar syrup or honey daily to keep it in prime condition. The cells will be well cared for in strong, queenless colonies, but to keep colonies queenless for long is expensive. It is a well-recognised fact that if a colony is divided by perforated zinc the portion away from the queen is in a condition to build and care for queen-cells and may be considered as virtually queenless.

Nursery Cages.

Before the queens are ready to emerge, about ten days from the time of transferring the larvæ, each cell may be put in some sort of nursery cage (Plate 144, fig. 2) so that as the queens emerge they will not kill each other or destroy other cells. As a rule individual cages for each queen-cell are best. If colonies are ready to receive them, the best method is to put each queen-cell in a colony so that there will be no necessity for introducing adult queens. In case it is desired to have the queens mated before introducing them to full colonies, the queen-cells or virgin queens may be put in small colonies usually known as nuclei. These are miniature hives built to hold about three frames. The queens may safely be kept in them, one in each nucleus, during the active season or until it is convenient to introduce them to full colonies.

SECTION VI.—INSECT ENEMIES AND DISEASES OF THE HIVE BEE.

The insects responsible for causing the greatest damage to bees are the wax moths, but where the combs are properly stored and fumigated and strong colonies of bees are maintained these cease to be a menace. Ants are sometimes very troublesome, and the beekeeper is well advised to destroy every nest within 200 yards of his apiary, but the other insect pests to be mentioned are of minor importance. As a queen bee in the height of the season lays from 1,500 to 2,000 eggs a day it will be realised that the small toll of bees taken by predatory bugs and flies is almost negligible.

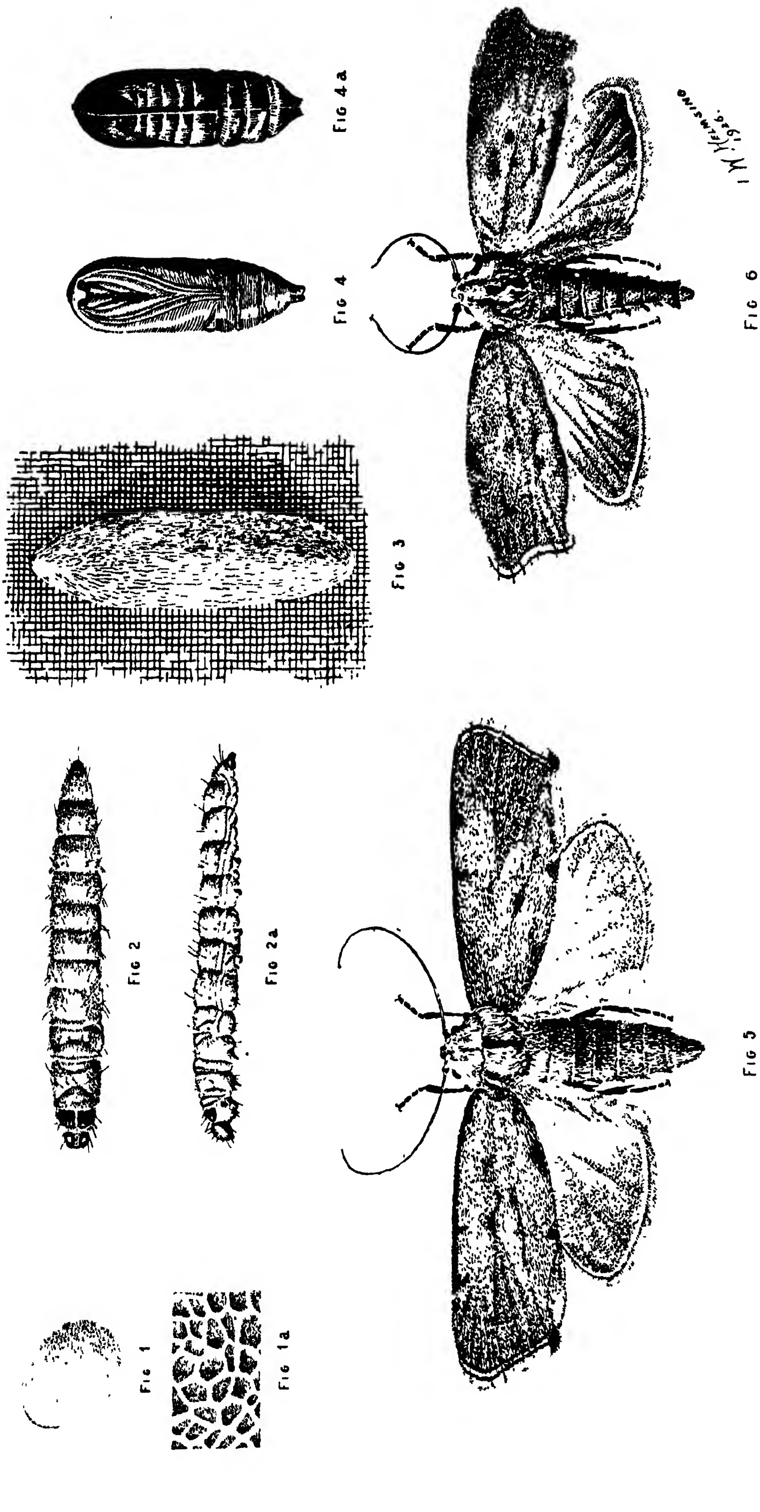


PLATE 169. LARGER WAX MOTH.

Fig. 1, Egg x 30.
Fig. 1a, Surface of egg x 210.
Fig. 2, Larva, dorsal view x 2.
Fig. 2a, Larva, lateral view x 2.
Fig. 3, Cocoon x 2.
Fig. 4, Pupa, ventral view x 2.
Fig. 4a, Pupa, dorsal view x 2.
Fig. 5, Adult female x 2½.
Fig. 6, Adult male x 2½.

Wax Moths.

Every beekeeper is familiar with the grey grubs which are responsible for the destruction of many of his combs. They are the larvæ of two different cosmopolitan species of moths, the larger wax moth, *Galleria mellonella* L. (Plate 169, figs. 5 and 6), and the lesser wax moth *Achroia grisella* Fab. Their habits are very similar, indeed, they may occur together in the same hive, but the former species is usually the more abundant and consequently the more destructive.

The popular name wax moths was doubtless given on the supposition that the food of the larva was chiefly wax, but attempts to rear them on chemically pure wax were unsuccessful. It was also noticed that they neglected nice, white super combs, and always attacked combs that had been used for brood-rearing which contained the larval skins left by developing bees or those containing brood or pollen. It is now known that these substances furnish the vitamins necessary for the full development of the moths.

The wax moths enter the hives at nightfall and deposit their eggs (Plate 169, fig. 1) about the combs into which the newly hatched larvæ tunnel. They line the sides of the tunnels with silk through which they can rapidly wriggle in order to escape from the bees. If the comb is held between the observer and the sun the movements of the larvæ within their tunnels are plainly visible. The typical appearance of an infested frame is shown in Plate 170.

When the larvæ (Plate 169, figs. 2 and 2A) are full grown they leave the comb and construct tough, white cocoons (Plate 169, fig. 3) of silk in which to undergo metamorphosis. These are generally attached to the top bar of the frames or to the sides of the hive. From the completion of the cocoons to the emergence of the adult moths occupies about a fortnight. The moths are then ready to fly about the hives, stored combs, or any wax refuse, seeking for places in which to oviposit and so produce another generation of grey grubs.

Wax moths invariably attack those colonies which are below normal strength, as the guard bees in a weakened colony are less alert in resisting the entrance of the female moths which are able to slip past, enter the hive, and scatter their eggs about the combs. In some instances the moths get in after the bees dwindle through queenlessness or excessive swarming. The remedy, therefore, is to maintain strong colonies, but unfortunately, in times of honey or pollen shortage this is not always possible. When some of his colonies become weakened the beekeeper should give them special attention and, if found to be infested, the combs should be gone through every few days, digging out moth larvæ with the point of a penknife and killing all moth grubs and pupæ enclosed in cocoons. By working along these lines the moth pest inside the hives would soon be under control. Additional precautions against infestation consist in cleaning up all scraps of comb found lying about, and keeping combs that are not in use by the bees safely stored in a place secure from attack by wax moths.

As one of the best assets that a beekeeper can possess is a good stock of surplus combs, great care should be taken to protect them from becoming infected with wax moth larvæ. This may be effected with little labour and at small cost by means of carbon bisulphide fumigation. To obtain the best results the supers for holding the combs should have all wax and propolis scraped from the top and bottom edges to

ensure a tight fit. The supers filled with the surplus empty combs should then be tiered up to ten high, and the crevices between the boxes pasted over with strips of paper so that the whole stack will be airtight, the top and bottom being made so by fastening a covering of board and newspapers securely to them to prevent the escape of the gas. The top covering is left open until the carbon bisulphide has been put on top of the uppermost set of combs. Some shallow holder is required for the carbon bisulphide, and the lever top of a 7-lb. honey tin will well answer the purpose. Such a tin-lid will hold quite enough of the liquid for a stack of ten supers, the quantity required for this number being about four tablespoonfuls. As soon as the carbon bisulphide has been inserted the top of the stack should be made airtight, and the stack is best left undisturbed until the combs are required.

When combs are to be put away until the following season carbon bisulphide should always be used although the combs may show no sign of moth grubs, as it is a cheap insurance of the safety of the combs. Care must be exercised in using carbon bisulphide which is both inflammable and explosive.

Ants.

Numerous species of ants disturb bees, and although they rarely attack them their presence irritates and excites the bees, resulting in the stinging of persons and animals near the hives. They may be conveniently divided into two classes, small and large, for the treatment recommended varies according to their size.

The small species consist of tiny black or red ants which overrun the combs and sometimes nest inside the hives. Where empty bags or pieces of hessian are used on top of the frames for mats these small ants take advantage of the warmth and shelter afforded and nest therein. Stands with various insulating devices have been recommended to protect the bees against such ants. While these may be useful to amateurs with only a few colonies, their adoption on a large scale where beekeeping is carried on commercially has been found impracticable.

The remedies likely to give satisfaction are:—Firstly, discard bag mats, for it is much better to have a bee space of ¼ inch between the top of the frames and the cover; secondly, mix 1 oz. of borax and ½ lb. sugar and boil for a few minutes in sufficient water to produce the consistency of thin honey, small quantities of this mixture being placed anywhere in the track of the ants, the mixture being covered in such a manner as to be accessible to the ants but not to the bees.

To the second class belong the meat ants, sugar ants, or other large species; these may readily be destroyed by means of carbon bisulphide. To destroy a meat ant's nest pour about an ounce of the liquid into each hole or crater in the mound and immediately cover it with bags. Then wait for three or four minutes, remove the bags, and apply a light attached to the end of a stick at least 5 feet long. The carbon bisulphide is highly inflammable, and no risks should be taken when applying the light to explode the fumigant.

Care must be taken not to explode the gas too soon. If the light be applied in less than the stated time it will be found that only a relatively quiet burning takes place, and there is no explosion causing the galleries to be shattered. The burning is, therefore, far less efficient than the exploding. The explosion is not completed for some minutes.

It is therefore advisable to wait about five minutes and then replace the bags over the nest. By again covering the nests the fumes are retained for a longer time, and many ants not killed outright during the explosion or before it will thus have less chance of recovering.

To obtain the best results it is advised that the work be carried out in the late afternoon, at which time there is the greatest number of ants present in the nests.

Other Insect Enemies.

Various other insect enemies have been reported by beekeepers from time to time. They are insects which have been found associated with the bees within their hives, and insects which are known to attack bees in the field. The former group includes such insects as cockroaches, plant bugs, beetles, and grasshoppers. Cockroaches are often found in even the strongest colonies, particularly on combs without bees; there does not appear to be any definite proof, however, that cockroaches injure the bees; indeed, one authority on beekeeping is of opinion that as the bees tolerate them in their hives they may be of use to the bee community. It has been observed that combs amongst which cockroaches are plentiful remained free from wax moth grubs, and it has been suggested that the cockroaches, which are omnivorous, eat the eggs of the moths.

The other insects mentioned have all been observed within the hives during the colder months, and as they were probably sheltering there temporarily, their presence may be disregarded.

The attacks made upon bees by insects in the field are of a more serious nature. Several species of predatory bugs have acquired the habit of hiding among flowers and seizing hive bees while they are engaged in gathering nectar. They have also been observed sitting on the tassels of maize cobs, catching and sucking the blood out of the bees as they come for the pollen. They are rather large and slow-moving bugs easily distinguished by the curved beak, which stands well away from the head basally, and by the very narrow head, always longer than broad. It is rather unnecessary to add that a beekeeper should destroy these bugs at every opportunity.

Dragonflies have occasionally been observed flying about apiaries and snapping up bees upon the wing. The natural food of even the largest species of dragonflies, however, consists mainly of mosquitoes, midges and other small flies. As complaints of this nature are not frequent, it is quite probable that the dragonflies invade apiaries only during periods when their natural food is scarce. When noticed hawking bees about an apiary, they may be captured with a butterfly net attached to a stick.

Large, active, robber flies capture other insects on the wing by spearing them with their hard beaklike proboscis. These flies do not discriminate in their prey, but will seize any other insect which they are strong enough to overcome. A proportion of their victims consists of hive bees, but remedial measures in this case are not practicable.

Termites.

In many localities termites, or white ants, cause much damage to hives. They do not attack bees, but quickly riddle the hive bottoms in direct contact with the earth. Colonies of termites have been observed

PLATE 170.
Frame of brood-comb showing damage caused by larvæ of the larger wax moth.

to eat up the bottom of a hive almost completely in one season. The remedies usually recommended consist in painting the underside of the bottom board of the hives with a chemical preservative such as coal-tar creosote, or with white arsenic at a strength of 2 lb. of the white arsenic to 10 gallons of water. The arsenic is not easily dissolved in water unless the solution is boiled vigorously, because the white powder floats to the surface and is difficult to wet. Experience over a large number of years has shown that white arsenic is a very effective poison against termites.

A local beekeeper has successfully overcome the termite trouble with cement bottom boards of his own construction. They are made in a mould and reinforced with cyclone wire-netting, as ordinary wire-netting is not quite strong enough. They are proof against weather conditions, as well as termite attacks. This beekeeper states that the bees winter in these hives quite as well as they do in the all-wooden article.

Foulbrood.

American foulbrood (Plate 171) is a disease of the brood of bees, which causes serious losses to beekeepers in many countries throughout the world. It is caused by a species of spore-bearing bacterium known as *Bacillus larvæ*. The brood becomes infected with the spores, which are invariably introduced into the hives in infected honey. The bees themselves spread the disease through the hive in their attempts to remove the diseased brood. When the disease has spread generally throughout the brood chamber, the bees cease trying to remove the dead brood, and the colony dies owing to the absence of emerging bees.

The disease may be recognised by the sunken and perforated cappings and the isolated sealed cells in the midst of recently emerged brood. The dead larvæ have a melted-down appearance and are usually extended lengthwise in the cells. Dead larvæ are slightly yellowish in colour at first, but become chocolate brown upon further decay. The decaying contents of the cell may, before they become too dry, be drawn out with a toothpick into fine silklike threads, which are quite ropy and gluelike. The dried-up brood, called scales, become tough and adhere so tightly to the floor of the cells that the bees cannot remove them. The bees usually make a small hole in the cappings when the disease is present and sometimes remove the cappings altogether, thus making it appear that the larvæ or pupæ died before being sealed. The odour is heavy and fœtid, rather resembling that of stale glue, this gluey odour being a marked symptom. Isolated sunken cells or perforated cells in the midst of healthy brood should be examined whenever disease is suspected. If in doubt, a piece of comb containing the suspected brood should be packed in a tin or small box and forwarded to the Department of Agriculture and Stock, Brisbane, for examination.

As previously mentioned, the only way the disease can be carried into a clean hive is with infected honey; it follows therefore that the chief precaution is not to allow the bees to obtain access to honey from an unknown source, and never to feed honey to bees unless it is known to be free from disease spores.

When queens are imported, it is a good precaution to destroy the accompanying workers, cage, and candy. If the cage method of introducing is adopted, the queen may easily be transferred to another cage that is known to be clean, before placing her in the hive.

PLATE 171.
Frame of brood-comb showing infection by American foulbrood.

In the United States much time and money has been expended during recent years in trying to find remedies for foulbrood. At one period disinfecting solutions were recommended, and later the shaking method was considered to be a cure. According to a recent publication, both these measures are ineffective. The shaking treatment is not now recommended because the disease is rarely eradicated by that method, and a treated colony on disinfected combs cannot be pronounced clean for two years. After a number of years trial of the shaking method, it is admitted that the disease situation in the United States has not materially improved.

It is now commonly recognised that the safest and, in the end, the most economical means of stamping out American foulbrood is to burn the diseased colonies. While this procedure may seem wasteful to those who believe that less drastic measures afford protection, it is the only method that leaves no opportunity for the disease to recur.

Before burning, the bees should be killed by closing the entrance in the evening and sprinkling a pint of petrol over the top frames, after which the hive is closed tightly.

A pit 18 inches or more in depth should be dug and a good fire should then be kindled in order to thoroughly burn the brood and honey. The hives containing the dead bees should be carried intact close to the pit and the bees and frames fed to the fire. After they are consumed the top-soil surrounding the fire should be raked into the pit to prevent bees from healthy colonies from having access to any dead bees or honey; the pit should then be filled.

After the burning, the hive bodies, bottom boards, and covers should be taken into the honey house, thoroughly scraped to remove all propolis and wax, and then scrubbed both inside and out with a hot soap or lye solution and a stiff brush. The scrapings should be burned and the wash water disposed of in such a manner that it is not accessible to the bees. Washing with soap and water is also the best way to remove spores from the hands, clothing, tools, and extracting equipment.

Chilled Brood.

Chilled brood is brood which has been killed by cold, and may be produced by any cause which results in the temperature of any portion of the brood chamber being too low. It may be the result of injudicious brood-spreading, insufficient nurse bees, or faulty hives which expose the frames of brood to cold winds.

Although it is not really a disease, chilled brood is sometimes mistaken for foulbrood, but it differs from the latter in the following respects:—The odours peculiar to foulbrood are absent. Furthermore, if the capping of cells containing chilled brood is removed, the dead bees will be found in natural positions, slightly shrunken, black at the head in early stages, and finally becoming black all over. The larvæ turn greyish at first and afterwards become almost black. When the weather conditions improve the bees will rapidly remove the chilled brood from the cells which have been uncapped, whereas they will not under similar circumstances remove brood affected by foulbrood.

Pickled Brood.

A condition known as pickled brood may be distinguished from foulbrood by the following characteristics:—If the larvæ of pickled brood are pulled out of the cell with a pin or match, they have the appearance of liquid matter, and if the brood in capped cells are similarly withdrawn the abdomen will be found to contain liquid matter, and the head will probably be dark brown in colour instead of the almost black colour in the case of chilled brood; there is further a total absence of the stickiness and peculiar gluey odour which is characteristic of American foulbrood. Pickled brood is generally considered to be the result of overheating.

Sacbrood.

This disease has been considered by some authorities to be the same as pickled brood and both sealed and unsealed larvæ may be affected. Larvæ killed by sacbrood will usually be found stretched out along the lower wall of the cell and often with the anterior end turned up towards the upper wall. The colour changes from a pearly white and may vary from yellow to dark brown or grey. The skin of the larvæ becomes toughened so that the dead mass may be lifted out like a small sac, the contents of which are watery.

Sacbrood seldom causes any serious losses among bees. Colonies may become weakened, causing a reduction of the honey crop, but a colony is seldom killed outright by it. The disease usually appears during early summer, disappearing again with the commencement of a good honey flow.

Paralysis.

Beekeepers often designate practically all the diseases of adult bees which they observe as cases of paralysis. The first symptom noticed is that some bees are being dragged out of the hive by others. The former present an oily or greasy appearance and generally exhibit a trembling and jerky leg movement. Some writers have attributed this condition to hereditary weakness and recommend requeening as a cure. The disease is also said to be more prevalent in hot climates than in colder ones, and in this State it usually occurs during the summer months. Unfortunately similar symptoms are stated to develop in cases of poisoning caused by the use of chemical sprays on fruit and vegetable crops. It would appear, therefore, that these conditions are produced by more than one cause, and much more study will be necessary before it will be safe to give advice or recommend any particular treatment.

Spring Dwindling.

It also seems probable that more than one disease has been included under the term spring dwindling. To avoid confusion it should be applied only to the loss of bees in the spring, due to the fact that the adults have been weakened by poor wintering and die faster than they can be replaced by emerging brood. Poor quality honey for winter stores or lack of stores may be among the contributing causes.

Although it is rather alarming in early spring to see an accumulation of dead bees in front of the hive entrance, the writers experience is that the total loss of a colony is infrequent. Generally a mild change in the weather accompanied by some rain causes a small honey flow and

the trouble usually disappears. If a little stimulative feeding with sugar syrup has been previously given when the dead bees were first noticed, the colony will quickly build up to normal strength.

Acknowledgments.

Thanks are due to the Queensland Museum for the loan of the material for Plate 170 and to Messrs. Smith Bros., of Brisbane, who kindly loaned the apparatus illustrated in Plates 139 to 144. The photographs are the work of Mr. W. J. Sanderson, Departmental Photographer, and the illustration of the life history of the larger wax moth was prepared by the Branch Illustrator, Mr. I. W. Helmsing. The writer is also indebted to Mr. J. A. Weddell for co-operation in assembling the plates, and finally desires to thank Mr. Robert Veitch, Chief Entomologist, for advice and assistance in the preparation of this paper.

DEMOCRACY AND LAUGHTER.

Happiness is the true touchstone of Democracy. Where any considerable number of people find life "weary, stale, flat, and unprofitable," there is something wrong.

Are we really a happy nation? With every element of happiness within our grasp it would seem, sometimes, that we fail fully to realise the great desire. The eyes of the world are upon us, and if, as a nation, we fail to impress peoples elsewhere by that elation of spirit which speaks for joy and contentment, we are poorly meeting our responsibilities as children of Democracy.

We cannot make people happy any more than we can make them good by the multiplication of laws. Laws are conducive to happiness only as they promote justice, equality of opportunity, and comfortable conditions of life. An edict that, on a certain day, every man, woman, and child . . . must be happy would be ridiculous. It is worth remembering that the search for happiness begins and ends in our own hearts.

Many years ago, Matthew Arnold complained that we . . . lacked intellectual seriousness. To-day, there is greater reason to fear that we have lost our capacity for laughter. We are solemnly warned that mighty problems cry for attention, but these will be solved much more quickly if we approach them buoyantly. We may be as earnest as we please, but we must keep smiling. The darkest prospect is not so black as it appears. When I pass a crippled machine in the highway and the owner peers out from under his vehicle and greets me with a grin, I know that he is master of the situation, and will soon be on his way rejoicing.

Pleasant it is on starry nights to hear the laughter of children at play in the street or the jazzy twang where light ankled youth trip gaily and know life to be good.

The loud laugh that speaks the vacant mind is one thing; honest mirth, testifying to courage, poise, and serenity of temper, is another. Humour is an efficacious antiseptic—a powerful tonic. So long as we can laugh, we are immune from defeat; there is still some heart in us for the great business of noble living.—MEREDITH NICHOLSON, in an American Exchange.

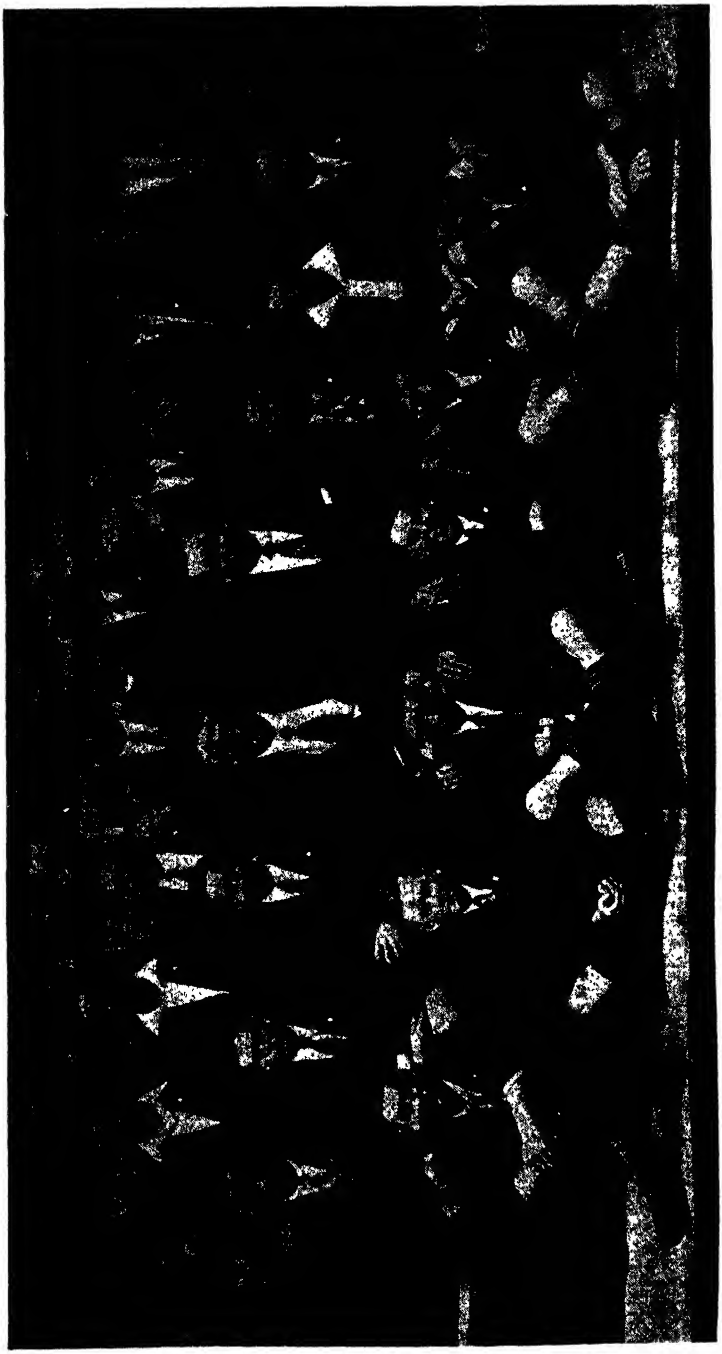


PLATE 172.—BRISBANE GRAMMAR SCHOOL GROUP.

On the occasion of an instructional visit to the laboratories of the Department of Agriculture and Stock. Seated in the centre are Messrs. Boyle (Agricultural Branch), Dakin (Teacher in Charge), and Kilmartin (Interviewing Officer).

Chloris Grasses in Queensland.

By S. L. EVERIST, Assistant to Botanist.

PART I.

THE genus *Chloris* includes a number of grasses of considerable economic importance. Perhaps the best known of these is Rhodes Grass (*Chloris Gayana*), but several native species are also useful pasture grasses.

Chloris grasses are easily distinguished by their seed heads. These usually consist of a number of spikes spreading out from the top of the seed stalk. Upon the lower side of each of these spikes are borne a number of spikelets or "seeds." These are arranged in two rows and consist of two outer empty glumes, thin in texture, with between them two or more "flowers" or florets. The florets break away above the glumes and fall, leaving the glume attached to the seed spike. The lemma or outer husk of the lower, or fertile floret bears a long awn. Above the fertile floret are one or more empty glumes, each of which also bears an awn.

Botanical Name.—*Chloris*, the goddess of flowers.

Common Names.—Most of the *Chloris* grasses are known as Star Grasses, Windmill Grasses, or Umbrella Grasses. These names, however, are applied to a number of different grasses with spreading seed spikes and are not confined to *Chloris* grasses. The name *Chloris* is short and euphonious, and should be quite a good common name for members of the genus. This would also eliminate the chance of confusing them with other grasses known by the above vernaculars.

Botanical Description.—Spikelets with one perfect floret and one or more male florets or empty lemmas above it. Spikelets sessile, crowded in two rows on one side of slender, solitary or digitate spikes. Glumes two, persistent. Rachilla disarticulating above the glumes. Lower floret hermaphrodite, lemma narrow, 3-nerved, apex usually 2-lobed and bearing an awn from the sinus; palea almost as long as the lemma, membranous, 2-keeled. Lodicules two, glabrous. Stamens three. Ovary glabrous, styles short, distinct; stigmas laterally exserted. Second floret male or barren. Lemma as in the fertile floret, but smaller. Palea, if present, membranous. Sometimes there is an empty lemma above the second floret. Grain linear or oblong, triquetrous, flattened, or concavo-convex.

Annual or perennial grasses, often with a creeping habit.

THE DIFFERENT KINDS OF CHLORIS GRASSES.

There are about eleven native species of *Chloris* grasses at present known in Queensland, and most of these are of some importance in the native pasture.

Two closely allied species are *Chloris divaricata* and *Chloris acicularis*. These, however, may be easily distinguished. *C. divaricata* is a small, fine-leaved plant which creeps along close to the ground. The young leaves are folded and the young shoots flattened. The spikes of the seed heads, too, are slender, weak, and somewhat flexuous. *Chloris acicularis*, on the other hand, has rigid, upright stems, and only

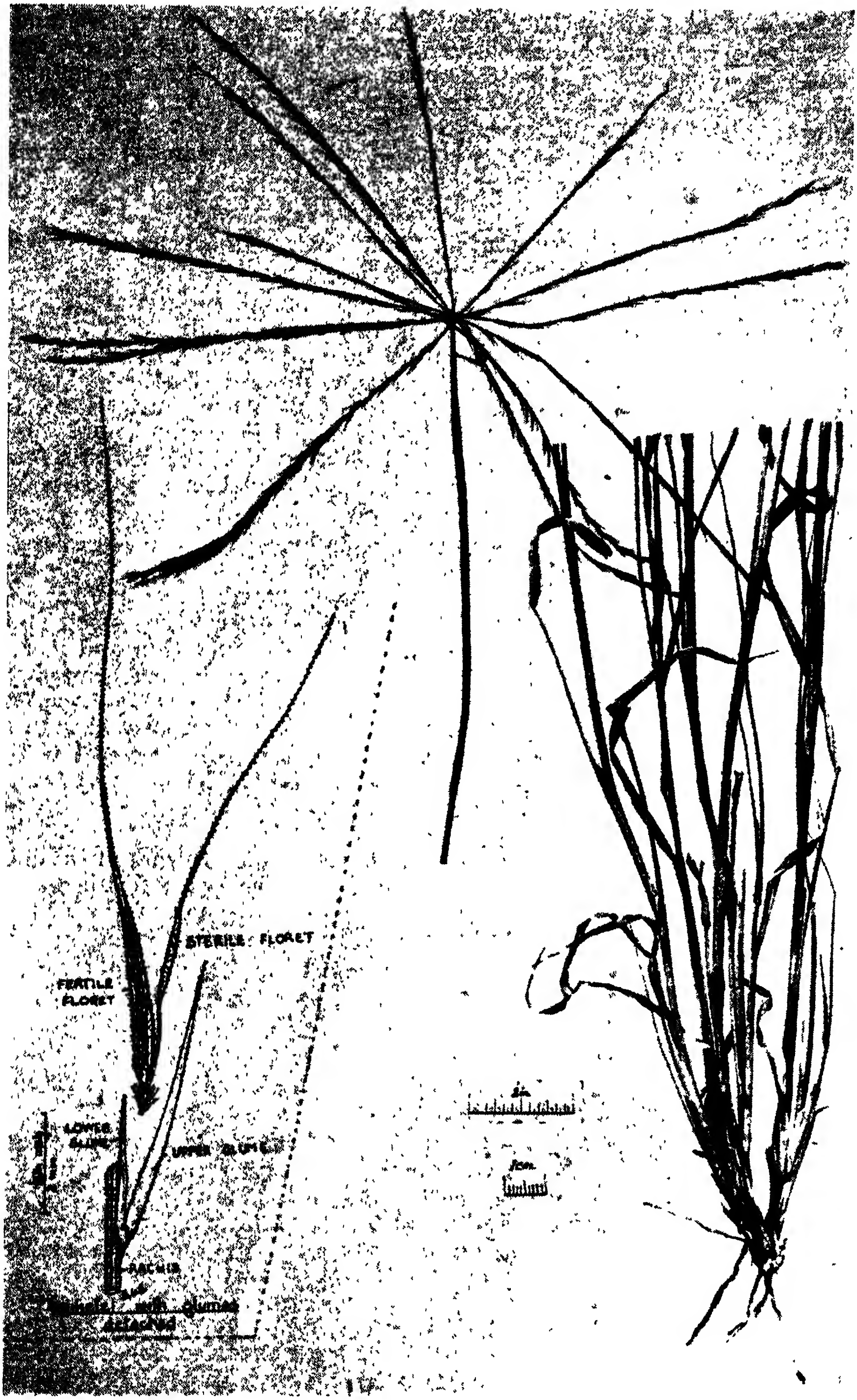


Plate 173.

Chloris acicularis.

occasionally runs along the ground. The leaves are rather hard and coarse, and are a pale bluish colour. When mature, the old leaves are strap-shaped and curly. The seed spikes are rigid and stiffly spreading. In addition, the spikelets of *C. acicularis* are larger than those of *C. divaricata,* and the "husk" passes into the awn with very little indication of lateral teeth, the lateral teeth of *C. divaricata* being much more prominent.

CHLORIS DIVARICATA.

Botanical Name.—*divaricata,* from Latin *divaricatus*—spread asunder, referring to the spreading seed spikes.

Botanical Description.—Stoloniferous perennial, sometimes tufted; stolons slender, branched, rooting at the nodes and sending up flattened leafy shoots. Lower leaf sheaths rather short, distichous, flattened and keeled. Sheaths of flowering culms not keeled. All sheaths glabrous, striate, with scarious margins. Ligule a ciliolate rim, auricles short, bearded, sometimes glabrous. Leaf blades folded in the bud, folded or flat when mature, mostly pale green and glabrous, sometimes with a few long hairs near the base. Nodes and internodes glabrous, leaf sheaths exceeding the internodes.

Spikes 3-10 or rarely more, usually 5 or 6, slender, somewhat flexuous, spreading. Base of spikes and apex of flowering culm very shortly ciliate. Rachis of spikes seabrous. Spikelets crowded, imbricate, sessile, in two rows on the lower side of the rhachis. Lower glume small and membranous, 1-nerved, 0.5-1.5 mm. long. Upper glume thin and membranous, 1-nerved, acute, 2.5-3.5 mm. long. Lower lemma somewhat indurated and usually dark coloured at maturity, scabrous, rounded on the back, obscurely 3-nerved, up to 4 mm. long. Apex usually bidentate and with a long, slender, scabrous awn from the sinus. Lateral teeth short, acute, not awned. Palea almost as long as the lemma, membranous, 2-keeled. Lodicules two, small, glabrous. Stamens three. Ovary glabrous, styles two, short, distinct, stigmas laterally exserted. Grain linear, almost as long as the lemma, triquetrous, pale brown and shining when ripe; embryo large. Rachilla produced above the fertile floret and bearing a single empty lemma similar to the lemma of the fertile floret, but smaller and thinner in texture.

Distribution.—*Chloris divaricata* is widely distributed in Queensland and is found in all parts of the State, from the coastal islands to the Northern Territory.

Habitat.—This grass grows on practically all types of soil, from heavy black soils to light sandy loams. In the interior it seems to favour the edge of the black and red soil areas.

Fodder Value, &c.—Recently, *Chloris divaricata,* togther with some other species of *Chloris,* has been brought under notice as a fodder grass of considerable importance. Though it runs to seed very quickly, it forms a very thick bottom growth, due to its running habit, and under heavy stocking tends to spread out and form a sward. Sheep are fond of the herbage, and analysis shows it to be fairly nutritious. After rain it comes away very quickly, and forms a good cover of palatable fodder. Apart from its value in the inland pastures, *Chloris divaricata* has been used experimentally for lawns and, in at least one case, for a bowling green. In this capacity it is said to have excellent possibilities, and seems worthy of further trial.

Reference.—*Chloris divaricata* R. Br., Prod. i, 186 (1810).

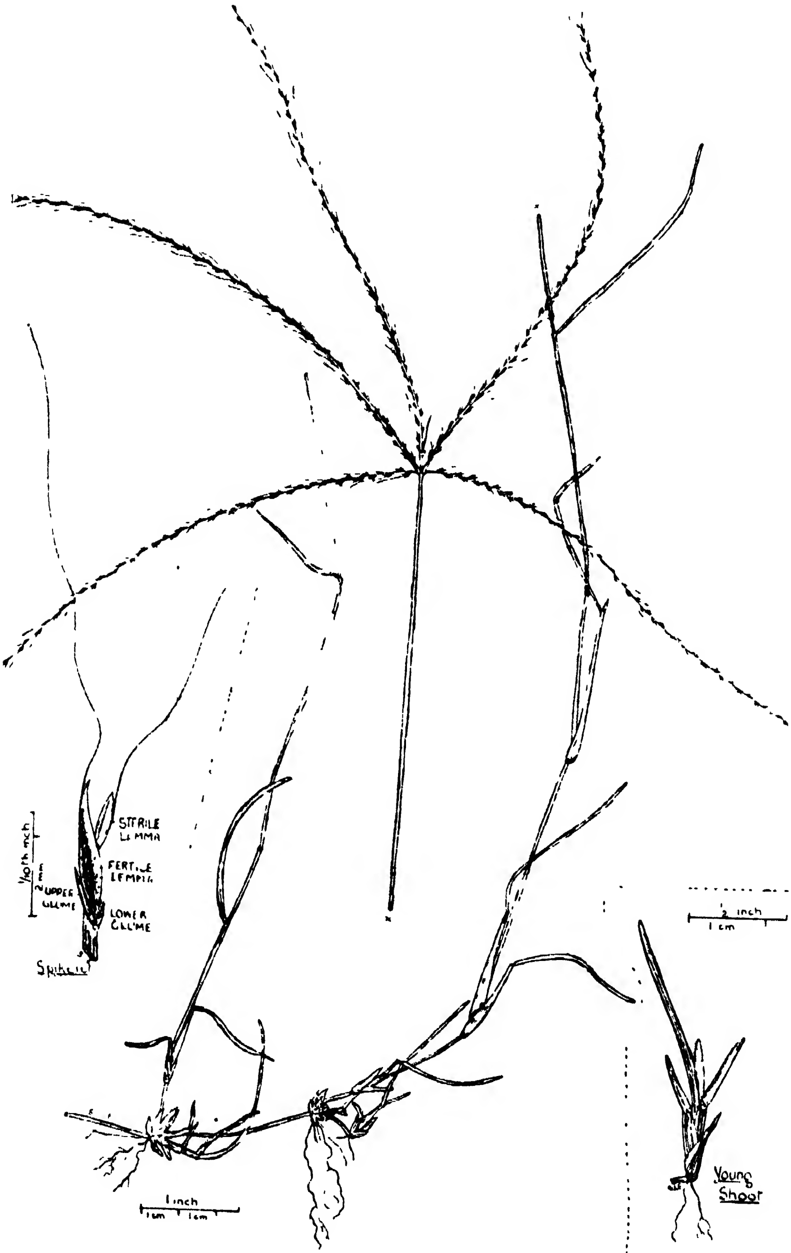


PLATE 174.
Chloris divaricata.

CHLORIS ACICULARIS.

Botanical Name.—*acicularis,* from Latin *acus*—a needle, referring to the needle-like lemma of the fertile floret ("seed").

Botanical Description.—Tufted perennial, usually branched at the base and from the lower nodes. Culms erect, hard and wiry, terete, smooth, nodes somewhat swollen, glabrous. Young shoots not flattened. Leaf sheaths shorter than the internodes, tubular, glaucous, strongly striate, and somewhat scabrous, usually bearing a number of tubercles. Ligule reduced to a ciliolate rim, auricles small, sometimes long bearded, sometimes glabrous. Leaf blades glaucous, convolute when young, usually flattened and curly when old, glabrous or hairy. Leaf blades strongly nerved, up to 20 cm. long and 0·4 cm. broad. Spikes 4-12, rigid and stiffly spreading. Spikes swollen, and silky villous at the base. Rhachis scabrid. Spikelets imbricate, crowded in two rows on one side of the rhachis. Glumes 1-nerved, narrow, keeled, acuminate, scabrid near the keel, lower 3-4 mm. long, upper 7-8 mm. long, narrowed into a fine point. Lower lemma up to 6 mm. long, indurated at maturity, scabrous, 3-nerved and dorsally keeled, with a deep groove on each face. Within each groove are a number of spinulose hairs. Lemma tapering into a scabrous, 15 mm. long awn. Lateral teeth very minute and inconspicuous. Base of the lemma with a fringe of long hairs round the callus. Palea membranous, 2-keeled, hairy on the outer face, almost as long as the lemma. Lodicules 2, stamens 3, ovary glabrous. Grain linear, flattened or concavo-convex, 5-6 mm. long, embryo large. Rachilla produced above the fertile floret, smooth and quite glabrous. Upper floret barren, consisting of a narrow, scabrous, awn-like lemma which passes almost insensibly into a fine, scabrous awn.

Distribution.—In Queensland it occurs over most of the State, with the exception of the coastal districts, though it has been collected at Gatton.

Habitat.—*Chloris acicularis* does not seem to favour any particular type of soil, though it is very common in Brigalow country.

Fodder Value, &c.—Little is known definitely of its fodder value, but it is readily eaten by stock, and in some places is looked upon as quite a good fodder. Like most of the other native *Chloris* grasses, it should repay investigation as a pasture grass.

Reference.—*Chloris acicularis* Lindl., in Mitch. Trop. Aust., 33 (1848).

[TO BE CONTINUED.]

EFFICACY OF THE CARBON TETRACHLORIDE DRENCH.

Since it has been stated that repeated drenching with carbon tetrachloride exerts an ill effect on the livers of sheep, the Director of Veterinary Research of the New South Wales Department of Agriculture recently conducted a field trial in collaboration with the Inspector of Stock at Glen Innes to determine the point. This trial showed that, even when drenched fortnightly with 2 c.c. of carbon tetrachloride, the sheep suffered no ill effects; in fact, they improved in condition. At the termination of the trial these sheep were sold for mutton, and there was no evidence of permanent damage to the liver.

Snapping Cotton.

By W. G. WELLS, Director of Cotton Culture.

THE term "snapping cotton" refers to the operation whereby the cotton crop is harvested by snapping off the entire cotton boll rather than by picking only the seed cotton out of the open boll The custom originated in the north-western portion of the main cotton belt in the United States of America during periods of scarcity of labour. Only a small percentage of the crop usually opens before the first killing frosts are experienced in this district, and generally the temperatures are sufficiently low to kill the plant so that the bolls are brittle and come off easily with a snapping motion. Considerable difficulty was at first encountered in cleaning and ginning such cotton, but the cotton gin manufacturers, realising the probability of the custom becoming established, eventually devised machinery which cleans snapped cotton in a remarkable manner. This has resulted in snapping being used extensively in the United States wherever labour is scarce or the cost of picking is excessively high.

Snapping in Queensland.

No facilities for treating snapped cotton were available in Queensland until following on the purchasing of the ginneries and oil mill by the growers from the proprietary company which first established them, when modern cleaning machinery was installed at the end of the 1931-32 season in the Glenmore Ginnery, Rockhampton. Special arrangements were made with several growers to send in consignments of snapped cotton to test out the machinery, and the results obtained indicated that snapping could be practised to advantage. Accordingly, growers in the Upper Burnett and the Callide and Wowan districts were allowed to snap in the 1932-33 season, which was marked by very low rainfall—exceptionally light yields mostly being the rule. Much of the crop in these distrcts was snapped, and the results obtained indicated that the

method was entirely suitable for such dry conditions. The Whinstanes Ginnery was therefore equipped in the 1933-34 season in order that all the cotton-growers could snap their crops if desired.

Snapping Results in the 1933-34 Season.

The harvesting period of that season, however, experienced the wettest conditions over the whole of the cotton belt of any in recent years. Showery, cloudy weather interspersed with cool nights and heavy fogs made the plants so tough and leathery that they were unsuitable for harvesting the crop by the snapping method. The showery conditions also delayed the gathering of the harvest, and many growers made only one fairly heavy first picking and then snapped the rest. The result was most unsatisfactory. Not only was the cotton often damp, but the toughened leaf and burr—as the outer part of the opened boll is named—became so matted in the fibres that it was impossible for the machinery to clean the latter in a proper manner. When dry, properly snapped cotton was sent in, however, an excellent cleaning of the fibres was effected.

Snapping Suitable in Queensland.

Snapping undoubtedly has a place in the harvesting operations of the Queensland cotton-grower, but should be practised only when the conditions are suitable. These conditions are that the burrs must be dead and brittle, most of the leaf should have fallen off, and the burr and cotton must be dry. Snapping from green plants not only tears off pieces of the fruiting branches and strips of the green bark, but also green leaf is gathered with the cotton. Such material contains moisture, and when pressed tightly into a wool pack undergoes a "sweat" which tends to make the fibres stick to it so tightly that it is difficult to remove anything but the largest particles, such as the burrs and branches, during the cleaning operations. Another argument against snapping when the plants are green is that the grower pays for picking heavier foreign material, and the Cotton Board pays more freight charges than if the contents of the containers are all thoroughly dry. These are important economic factors, especially for growers with large acreages, for it must be remembered that the ginneries are equipped with driers, and where cotton is damp it is dried before it is weighed for payment.

In respect of picking and freight charges, growers should pay more attention to the quality of the snapping. During the 1933-34 season some consignments of snapped cotton came in which were of such low grade that they were not accepted. Such cotton contained not only an excessive amount of leaf, but a high percentage of empty burrs, the cotton of which had obviously been hand-picked earlier in the season. A large number of completely diseased bolls and hard worm-eaten dried-up bolls—or "hickory nuts," as they have been named—were also included. Growers allowing such snapping are simply paying excessive net harvesting costs for their cotton, and, in addition, the quality of the already low-grade lint is further lessened through the fibres becoming so badly mixed with the foreign matter that the cleaning machinery can remove only a small proportion of it.

What to Snap.

In normal seasons it is recommended that only the top crop be snapped. Usually the plants do not die sufficiently prior to the maturing of the top crop to make them suitable for snapping. Some growers follow the practice of leaving the crop open until a heavy first picking can be made and then waiting until frosts open the top crop, when everything on the plants is snapped. Unless only a very light second picking can be made, it is not recommended that this method be followed. In any variety of cotton the fibres in the top bolls are shorter than on the rest of the plant, and generally softer and weaker. Usually in Queensland the lint of the top crop also contains considerable yellow spot, caused by bacterial diseases entering punctures made in the green bolls by sucking insects. Where the late middle and top crop is snapped together, the grower undoubtedly loses the value of considerable cotton of much higher quality than that of the top crop. This was noticed in many consignments received at the ginneries in the 1933-34 season. Owing to the late, showery conditions a large percentage of the top crop was badly spotted. Growers who sent in dry cotton composed of the upper middle and top crops were disappointed with the grades they received, for much of the bolls had contained excellent cotton. The mixing with the spotted top crop, however, made the resultant lint so badly discoloured and of such wasty nature that only low grades and staples could be given it, although it was obvious that a high percentage of the fibres were of superior quality.

Varieties Suitable for Snapping.

It has been found in the U.S.A. that some varieties are much more suitable for snapping than others. Investigations are being carried out in Queensland by the Department of Agriculture and Stock to ascertain if similar differences occur here. Growers with more than one variety should study this point as well, to ascertain the effect of their own soils, and report their observations to the Department.

The ideal boll for snapping is one in which the burr comes away freely from the stem, by which it is attached to the fruiting branch. Such a boll if snapped after the leaves have fallen not only gives the minimum quantity of trash in the containers forwarded to the ginnery, but owing to the divisions breaking apart is easily separated from the seed cotton in the cleaning machinery. The grade of cotton snapped in such condition is generally practically equal to the grade that would have been obtained had the cotton been hand-picked. Spinning tests carried out in the U.S.A. have shown that the lint obtained from properly snapped cotton which has been treated with modern cleaning apparatus compares favourably with hand-picked cotton.

It is believed, therefore, that if growers pay greater attention to the points which have been touched upon, more satisfactory results will be obtained with the snapping method of harvesting. Most of the snapped cotton will naturally be of low grade in Queensland on account of the spotted condition of the lint of the top crop, which is the only part of the crop that should be snapped under ordinary conditions. This is well worth harvesting, however, especially where a grower has a large acreage, for the net value obtained will often be a substantial contribution, especially in seasons of late frosts.

Snapping may delay Preparation of New Seed-Bed.

It is pointed out, however, that growers should guard against snapping so late in the season as to delay the preparation of the seed-bed for the next crop. Rains generally occur during the first half of June in all the main cotton-growing districts, and every effort should be made to use this moisture to the fullest advantage in preparing the new seed-bed. July and August are mostly dry months, and on the older cultivations of the heavier clay loam or clay types growers frequently experience great difficulty in completing their ploughing if the start of the operation is delayed too long, especially men with large acreages. Experiments and the experiences of growers have demonstrated clearly the advisability of growing cotton in rotations with grass and fodder crops, and it is recommended strongly that where a grower with a large acreage practises snapping, a portion of the acreage for the next season should follow some crop that will allow of preparation of the seed-bed ahead of the June rains. This will allow of ample time to plough the portion following cotton, and will also reduce the effects of any delay in snapping the crop due to unfavourable climatic conditions, shortage of pickers, or any other detrimental circumstances.

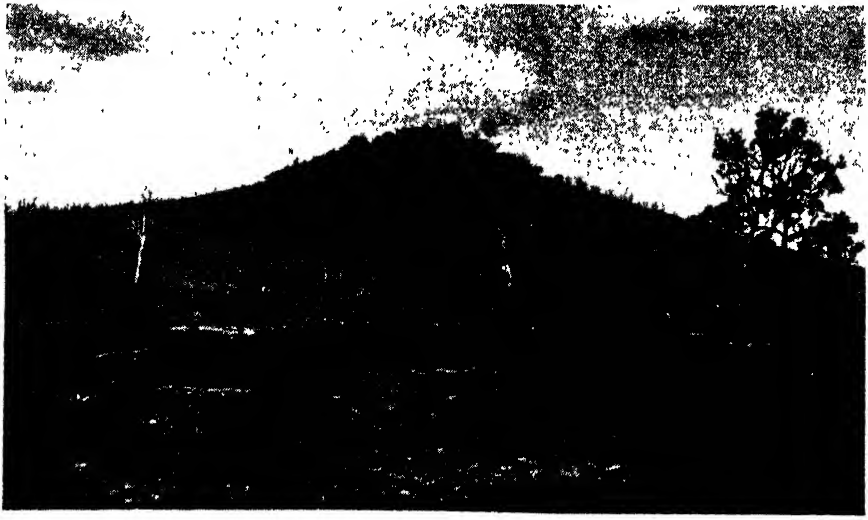


PLATE 175.

Erosion on a Queensland Farm.—Note deep gullies in course of formation on what was formerly level alluvial land.

Classing Cotton.

By R. W. PETERS, Cotton Experimentalist.

Historical.

What is the value of my cotton? is a query that has always concerned cotton growers the world over, when, having harvested the crop, they have forwarded it to the ginnery. In the early periods of cotton growing no attempt was made to evolve any standards which would allow of some rough estimate being placed on the value of any particular cotton. The crop was sold on a basis of bargaining, or in the case of fancy cottons, by contract between the grower and manufacturer. The rapid development of both the cotton growing and spinning industries became of such importance, however, that obviously some system of standards to assist in the selling of such an important commodity had to be developed.

The earliest records of cotton classing extend back to 1800, when cotton arriving at Liverpool, which was the centre of the cotton manufacturing world at that time, was identified by various terms which designated its quality and source of origin. Gradually this custom extended with modifications to other centres—especially the United States of America, where the bulk of the world's crop was produced. As cotton spinning was introduced into other countries new sets of terms originated, with the result that a large series of standards were operating at the various consuming centres.

It was realised eventually that some general uniform system should prevail, and accordingly the Department of Agriculture of the United States of America prepared a set of World's Universal Standards for American Upland cotton which were finally accepted by the Cotton Exchanges throughout the world. Approximately every two years the Officers of that Department prepare new sets of standards, which are passed upon by representatives of the various cotton exchanges, who meet in conference at the main classing rooms of the Department of Agriculture at Washington, D.C. Hundreds of copies of the sets finally agreed upon are then prepared for sale as reference types to purchasers of American Upland cottons.

These standards have greatly simplified the selling of American Upland Cotton and have also made it possible for the purchaser to buy cotton on description without the examination of actual type samples. Daily quotations of American cottons of the range of the World's Universal Standard Grades and of the various staple lengths are made in the main cotton exchanges throughout the World. It is thus possible to form a reasonably accurate estimate of the value of any American types of cotton as soon as the grades and lengths of fibres are known. This fact is of great importance to the Queensland cotton growers as only varieties of American cottons are grown here in any quantity.

Cotton Classing in Queensland.

As the cotton being grown in Queensland at the commencement of the present industry was of the American Upland type, the World's Universal Standards were adopted as a basis for the preparation and marketing of the crop, so that the grower could obtain the full value for

his produce. This method has been found suitable for Queensland cotton and is now used in grading it. The Queensland crop, being handled through a Commodity Pool, makes it necessary to class each container of seed cotton as it arrives at the ginnery, in order that an estimate of its quality may be made and an initial payment of around 80 per cent. of its value may be sent to the grower. This system of classing is carried out by a staff employed by the Queensland Government. The graders are mostly former qualified wool classers trained for several years by an experienced cotton classer, who had classed types of cotton similar to those grown in Queensland, not only in Liverpool but also in the United States of America.

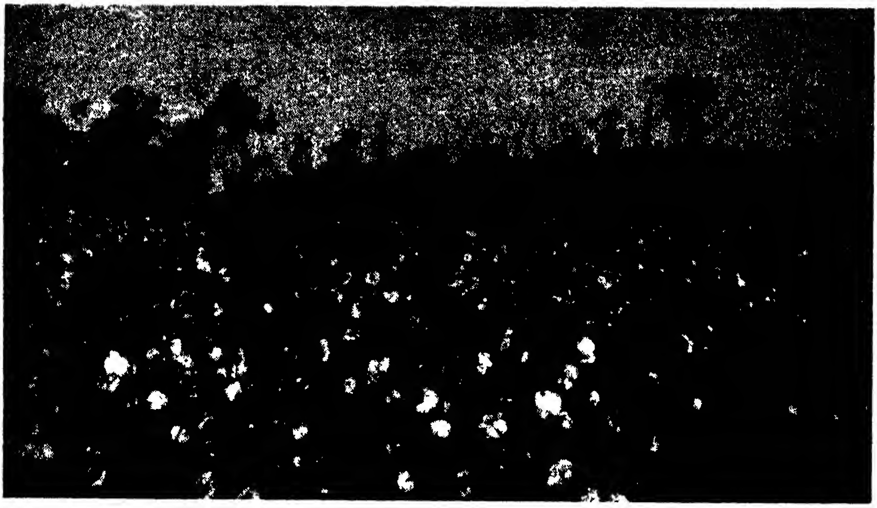


PLATE 176.
Ripe for the Harvest.—A Field of Cotton, Mundubbera.

When the container of seed cotton arrives at the ginnery the contents are examined by a grader, who first determines the grade and then the length of the fibres, or staples it, as the operation is termed. Each container is then weighed, check weighed and checked against the amount of cotton the grower states on his advice note that he is sending to the ginnery, after which it is segregated into the proper stack for ginning according to the grade, staple, and variety. When the cotton is being ginned two samples are drawn from each 500 lb. bale of lint in such a way as to represent the average contents. These samples are sent to the classing room, where they are graded and stapled under an even light. Every bale is classified against a set of lint standards of Queensland cotton which is based on the key set of Universal Standards for American cotton that are obtained from the United States Department of Agriculture every time new reference sets are made. The average contents of each bale of lint are thus known, and also the grade and staple of each container of seed cotton from which the bale of lint was obtained. This enables the grader of the seed cotton to check on his classifications throughout the season, and thus ascertain if the seed cotton is producing lint of the quality he has estimated.

When the system of grading the Queensland crop was first started it was believed that it would be more equitable for all concerned if rather broad grades of seed cotton were used rather than try to class exactly to the lint grades of the Universal Standards. The resultant bales of lint were classed according to these Standards, though, with fairly satisfactory results. Certain weaknesses in the system have become apparent, however, with the expansion of the industry. Accordingly, as the new Commonwealth Bounty Scheme, which came into force with the harvesting of the 1934-35 crop, necessitates the establishment of a set of grades for lint cotton, a new system has been inaugurated whereby the lint of each container of seed cotton arriving at the ginnery will be classed in terms of the grades used in the

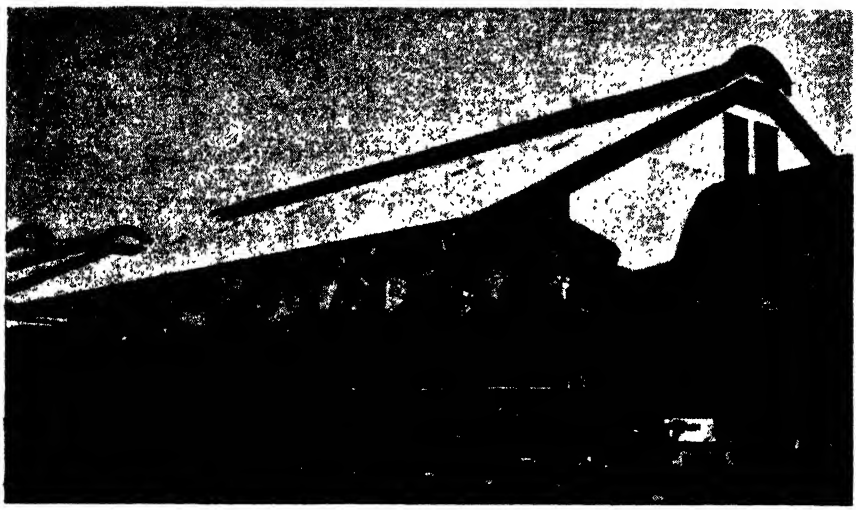


PLATE 177.

Queensland cotton arriving at the ginnery. Second hand wool packs are used for sending in the bulk of the crop. On an average 500 to 550 lb. of seed cotton is packed in each bale.

Universal Standards. This will be a decided improvement over the old system, for in some of the grades of seed cotton previously used cottons of a wide range of quality were paid for at the same rate. Under the new system the grower will receive a price for his cotton which will be directly commensurate with that realised from the ginned consignment. There will thus be every inducement to produce cotton of good quality.

Queensland Grades.

Although the World's Universal Standards for American Upland cottons are the basis for the classing of Queensland cotton, it has been found necessary to deviate from them somewhat on account of the tendency for a considerable proportion of the Queensland crop to contain more spot than the Universal Standards will allow in the white grades. Accordingly the Queensland crop is classed into white, light spotted, and yellow spotted grades, the white grades being equivalent to the Universal Standards in all respects, with the light spotted having the same amount of colour, trash, or foreign matter as the white

grade but containing more spot. The yellow spotted grades also contain the same amount of trash as their comparable white grades but have a decided yellow tinge and may also be of softer cotton than allowable in the mature white grades. The following grades are used in classing the Queensland crop—Middling Fair being the highest and Ordinary the lowest grades:—

White Grades.	Light Spotted.	Yellow Spotted.
Middling Fair	..	..
Strict Good Middling	S. G. M. light spotted	..
Good Middling	G. M. light spotted	G. M. yellow spotted
Strict Middling	S. M. light spotted	S. M. yellow spotted
Middling	M. light spotted ..	M. yellow spotted
Strict Low Middling	S. L. M. light spotted	S. L. M. yellow spotted
Low Middling	L. M. light spotted	L. M. yellow spotted
Strict Good Ordinary	..	..
Ordinary	..	..

Factors Determining Grades.

The factors determining the grade of a sample of cotton may be roughly described as—colour, amount and nature of foreign matter contained, and in lint cotton, the condition in which the ginning has left the fibres. All of the grades higher than Strict Middling must be of good colour and have a decided "bloom" or freshness of appearance. Each successively lower grade than Strict Middling becomes progressively duller of colour until the lowest is of a greyish appearance. There is a comparable scaling down in the amount of trash, leaf, etc., in the different grades, the Middling Fair carrying practically no foreign matter, while the Ordinary is well mixed with both large and small pieces of leaf, burrs and bits of seed. All of the grades above Strict Middling can carry but very little fine spec or "pepper leaf" as it is called. The ginning effect on the fibres is most important for the different lengths of fibres have to be ginned at different rates of feeding of the seed cotton to the gin-saws. Where this is not carried out properly much cutting of the fibres occurs, especially if the fibres are of a softish character or are damp either from rains or from being "green" as cotton is called, that has been picked too soon after the bolls have opened. Gin cutting or ginning when the cotton is damp gives a very wasty, uneven appearance to the lint and a bale of such quality is penalised, for in the spinning operations a high percentage of loss is obtained.

Character of Cotton Fibres.

Another factor taken into consideration when grading or valuing cotton is the character of the fibres. This term, broadly speaking, is based on the strength, body, drag, or twist of the fibres and the degree of neppiness of them. The fibres of a cotton of "good character" are

of good strength and body, have a decided drag when a sample is broken apart and contain very few "neps." The latter term is used to describe small bunches of fibres which tend to roll up and mat together so tightly that the spinning machinery cannot straighten them out. Generally speaking, a cotton of good character gins and spins well. A cotton of poor character, on the other hand, does not gin well, for it generally becomes of a very wasty appearance, with many gin cut, shortened fibres and a large amount of neps. Such cottons usually are the result of either growing unsuitable varieties or of adverse environments, such as lack of proper cultural methods and exceptionally dry hot conditions.

Stapling Cotton.

Stapling cotton means to obtain the average length of the bulk of the fibres. This is an operation which requires years of practice for one to become thoroughly proficient in it. An experienced classer can usually form a very close estimate of the working length of the fibres and in the course of making the determination also notices the amount of waste, neps, short fibres and uniformity of the bulk of the fibres. Generally cottons are measured in 1/16th of an inch gradations although in very uniform cottons it is possible to staple to 1/32 of an inch.

Points for Growers to Observe.

Much depends upon the individual grower, especially during the process of harvesting, as to what his cotton will be worth and every factor adversely affecting the quality of the lint should be guarded against. When packing a container every care should be taken to have only one grade and staple in it. A bale of lint is sold on the basis that it is of a uniform content. If there is decided variation of quality encountered it is purchased on the value of the lowest grade and shortest staple contained. Many large growers allow pickers to empty their picking sacks directly into the wool pack, and where this is done layers of markedly different grades often result, owing to the variation in quality of picking. It is recommended that a grower should grade his crop into at least three grades, such as clean, leafy, and stained, with a wool pack for each. As each picker brings his cotton forward for weighing, it should be graded and then emptied into the proper container. If such a system was practised generally the grower would often obtain a better value for his cotton, and more regular cotton would be fed to the gins, which would assist in the greater production of uniform bales of lint. In the United States of America the custom is to empty picker's bags into a waggon, distributing the contents over the whole surface, thereby obtaining an even blend. On arrival at the ginnery the seed cotton is taken out of the waggon by means of a movable suction spout, which results in an additional blending. It can be seen, therefore, that more attention should be paid here to sending in containers of uniform content.

Some growers seem to think it desirable to pack their bales as heavily as possible, especially when transport charges are high. It is pointed out, however, that when the bale is packed so tightly a certain amount of sweating occurs with the result that not only does the cotton open up in a hard cake-like mass which is difficult to blend, but the fibres are so embedded into any foreign matter that it is difficult to free them of it in the ginning process.

Undoubtedly growers should pay close attention to the points which have been touched upon. The present carry-over of large stocks of cotton in various parts of the world, and the intense competition which is going to take place between cotton producers in the future, make it imperative to produce the best possible cotton and prepare the finished product in the most satisfactory manner, in order to compete profitably on the world's market. Countries failing to do this will be marketing at a disadvantage. This is especially true regarding Queensland cotton, with the high transportation charges and the amount of the crop that will normally be exported.

PLATE 178.
Amid the Farmlands of Fassifern.

THE dry conditions obtaining throughout the agricultural districts during March have continued and, at the time of writing, rain is urgently required to freshen the pastures and permit the cultivation and sowing of land for winter crops. The absence of any normal wet season rains has caused the usual seasonal decline in dairy production to become more pronounced. Lucerne cuttings have been light, and as a result of the demand for fodder occasioned by the serious drought in the western pastoral districts prices have risen considerably.

Maize.

Some good crops are being harvested in the Mary Valley and similar favoured areas, but elsewhere yields will be below normal. Many crops failed for grain purposes, and were therefore utilised for fodder. Excellent prices are being received, and growers who were able to store the grain in tanks are now reaping the benefit.

Fodder Conservation.

This subject crops up periodically during periods of scarcity, to be again allowed to lapse with the return of good seasons. It is quite impossible to ensure a continuity of nourishing feed without conserving fodder, or, in the more favoured districts, by laying down improved pastures. High quality wool, mutton, and beef can be produced if stock are not allowed to suffer periodical setbacks in their condition. Experienced western partoralists consider it impracticable to conserve bush hay during good seasons, owing to the sparseness of the native grasses, the large areas and numbers of stock to be dealt with, and the difficulty of obtaining labour. Consideration, however, could be given to the purchase of commodities such as lucerne hay and maize during normal years when prices are not unduly high, and to their storage at the point of consumption, or, alternately, to the purchase of rich farm lands by the pastoral organisations, who could then engage in the regular production of their requirements. This should be preferable to buying grain and fodder at exorbitant rates during drought periods.

Wheat.

Land is now receiving the final preparation prior to sowing when weather conditions permit. Cultural operations have been considerably retarded, owing to the dry conditions making the land too difficult. Fortunately the sowing of suitable varieties may be extended to July, the chief difficulty at present being the sowing of crops for winter feed. The sowing of winter grasses and clovers has been similarly retarded, which is unfortunate in view of the increasing attention now being given to this practice.

The census of wheat varieties grown during the 1934-35 season shows that Florence has retained its position as first favourite, the five chief varieties being as follows:—

Variety.	Acres.	Percentage of Total Crop.
Florence	46,682	16·27
Three Seas	44,924	15·67
Flora	33,951	11·84
Gluyas	24,392	8·51
Pusa	23.388	8·15

Three Seas has increased its area and will probably exceed Florence in the near future owing to its comparative freedom from rust and ability to yield heavily on a variety of soils. However, the quality of the grain is inferior to Florence or Flora.

Sugar.

With the exception of the Burdekin, weather conditions throughout the sugar areas during April were showery and cool. While soil moisture was generally satisfactory, the reduced temperatures were not conducive to vigorous crop growth. This month, preliminary crop estimates will be prepared; on the present prospect it is probable that the total tonnage for the coming harvest will be substantially less than that of the 1934 season.

Tobacco.

Most of the crops in the Texas, Inglewood, Miriam Vale, and Bundaberg districts have been harvested, and many of the growers are commencing grading operations. In the northern areas where adverse conditions were experienced with early plantings, crops now give promise of returning good yields. Splendid rains received in most of the districts at the end of February entirely altered the position, the early planted crops which were either dying off or prematurely ripening, filled out and the resultant cures are turning out satisfactorily. The late planted crops have made excellent growth and given fair conditions from now on will give excellent yields provided an early winter does not intervene and with it the usual curing difficulties. The long period of dry weather experienced in the early part of the season has been very beneficial in checking disease.

Cotton.

Dry and rather warm weather has mostly ruled throughout the main cotton-growing district during the past three months. Such conditions have greatly curtailed the crop prospects which appeared likely to be realised at the end of January. The plants were then generally

so very heavily laden that good rainfall was required for the rest of the season to develop the crop. The dry conditions which prevailed, however, caused a general loss of top crop and hastened the maturing of the bolls developed. Picking started in mid-February and has continued practically unabated through weather conditions very favourable for obtaining high grades. The picking tallies have generally been good, particularly in the big-boll medium staple varieties which have been distributed in increased quantities this season. Although the average yield per acre will probably be less than that of last season, when a record crop was produced, it is anticipated that a total yield approaching the previous one will be obtained as a greater acreage has been reported by the growers at mid-season as having prospects of producing yields.

The seasonal conditions have again demonstrated what an important part cotton should play in the cropping system of most of the agricultural districts away from the immediate coastal conditions. In most of these areas, particularly in the more inland ones in the Burnett and Central Districts, all fodder and grain crops have suffered most severely from the adverse conditions, while cotton crops, although checked, have yielded well enough generally to produce returns covering the costs of production or better. With one soaking rain at mid-January the average cotton yields would have been most appreciably increased while only moderate improvement would have been effected in other crops

Crossbred Lambs.

Approximately 2,000 lambs raised under the Departmental scheme and sold in the open market, brought 4s. per head more than merino lambs of the same age. The average price of crossbred lambs four and a-half months old drawn from thirty farms was 17s. 8d; Border Leicester, Southdown Lincoln, Romney Marsh, Dorset Horn, and Shropshire rams were utilised, mostly from Southern Studs. These results are encouraging and farmers will be keen to experiment further with the various crosses with the merino.

PLATE 179.
A Field of Maize below the Range

Ulcerative Spirochætosis of Pigs.

By K. S. McINTOSH, H.D.A., B.V.Sc.

RECENTLY several cases of the above disease have been brought to the notice of this Station. Apparently it is the first time that the condition has been definitely diagnosed in Queensland and the object of this article is to supply pig owners with all the available information concerning the disease.

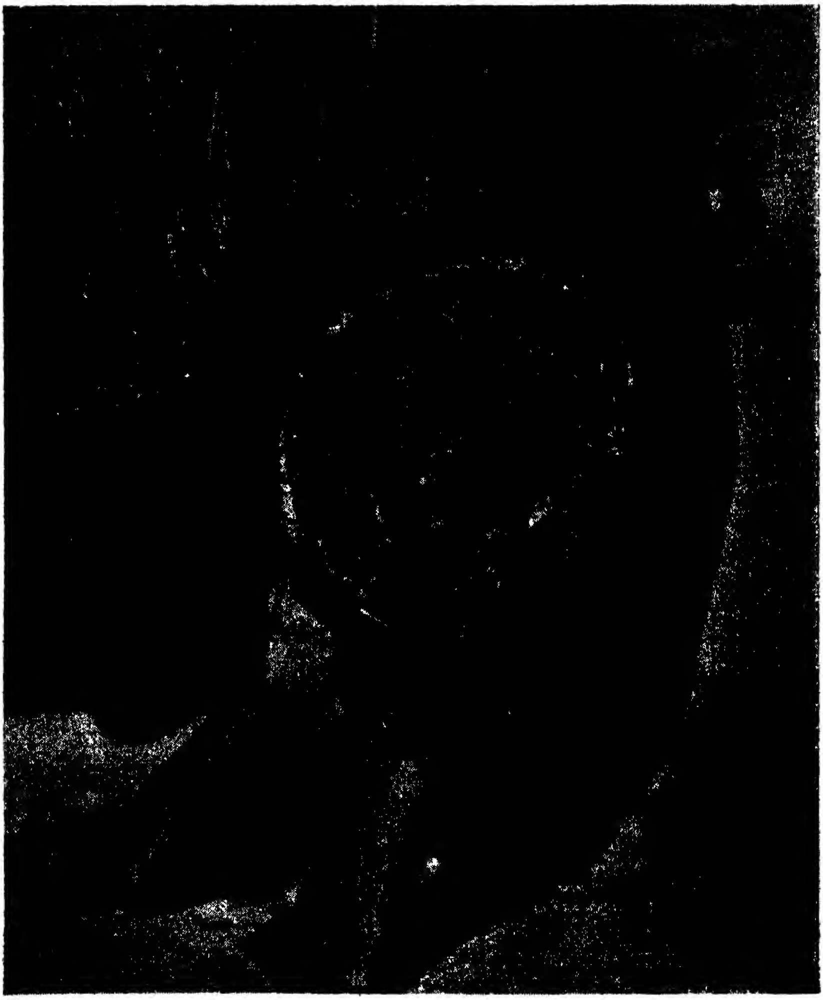


PLATE 180.
A typical skin lesion of Ulcerative Spirochætosis.

Mr. A. L. Clay, B.V.Sc., District Veterinary Officer at Cairns, was the first to make a tentative field diagnosis of the condition, which was confirmed at this Station on the examination of specimens.

The disease has also been diagnosed in material forwarded from Boonah.

Following this, a live pig affected with ulcerative spirochætosis was forwarded from the Maleny district and Mr. J. C. J. Maunder, B.V.Sc., Veterinary Officer, reported that fifteen pigs on a property in the Gayndah district were affected.

It is impossible to estimate the extent to which spirochætosis is present in Queensland at the present juncture. In New South Wales the condition is not at all uncommon.

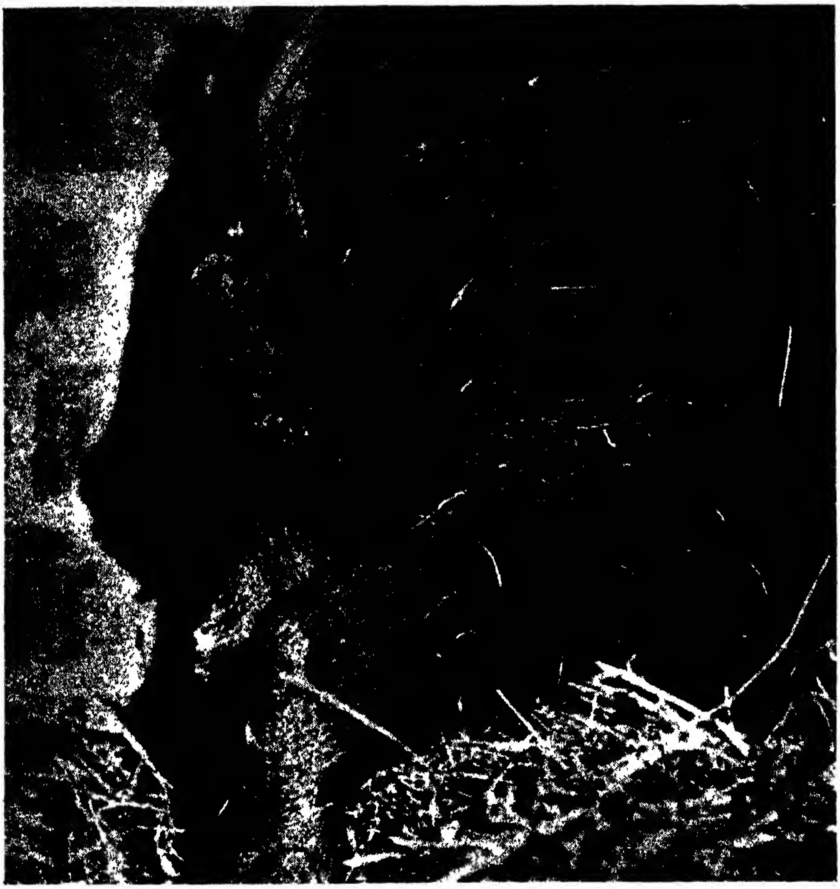


PLATE 181.
Ulcerative Spirochætosis of castration wound. Note the protruding mass of "proud flesh."

Cause of Ulcerative Spirochætosis.

As the name denotes, the disease is caused by a spirochæte or spiral-shaped germ.

Apparently the germs gain entrance to the body through wounds and scratches of the skin or deeper structures. It is not uncommon to find the sockets of the teeth affected when the milk teeth are being shed, and it is frequently seen causing large abscesses following castration.

Other organisms are also present but are regarded as secondary invaders and not the primary cause.

Symptoms and Lesions.

When the spirochæte gains entrance to the tissues it seems to remain more or less localised. A swelling which appears in the skin and underlying tissues gradually enlarges, finally bursts, and a dirty

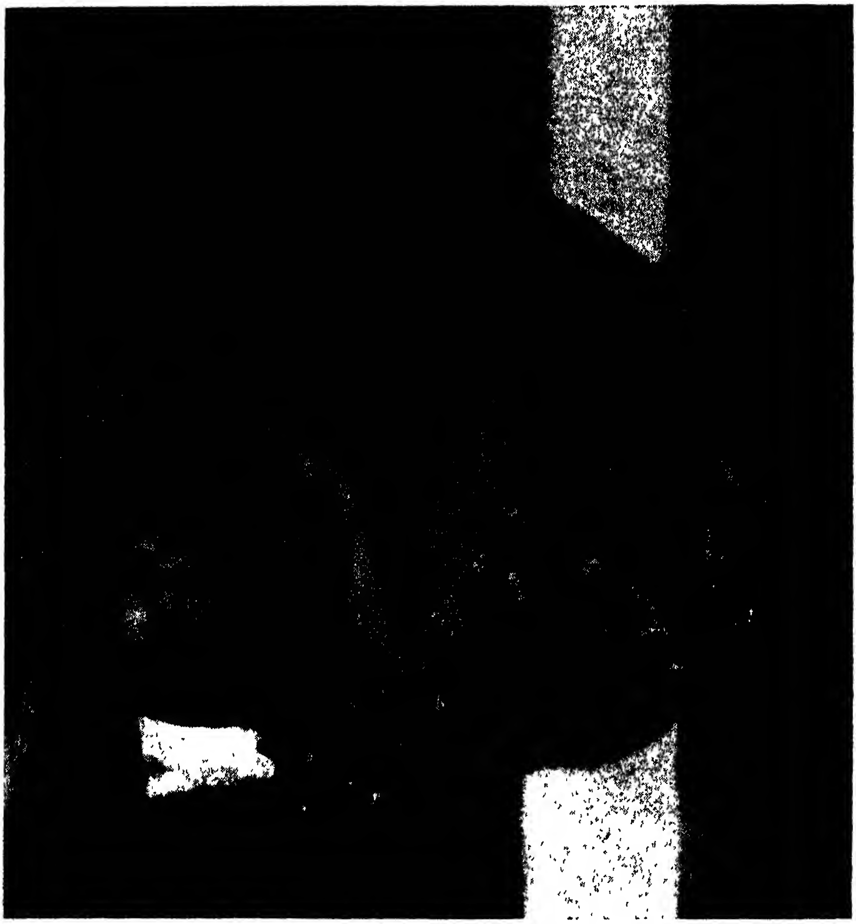


PLATE 182.
Sucker with mouthparts affected with Ulcerative Spirochætosis.

greyish pus is exuded. The ulcer so formed does not heal but gradually extends and becomes covered with a dark granular scab, usually adhering fairly firmly and having under it the pus already described. This lesion may be anything up to 6 to 9 inches in diameter. There is considerable new tissue, fibrous tissue, and dead flesh formation as a result of the chronic inflammation and the base of the ulcer is often fairly firm, but sometimes the pus extends inwards and affects the deeper structures also.

In the case of infection of the jaws during the shedding of teeth, the jawbone is attacked, resulting in channels of pus, dead bone, and loosening of teeth. The tongue often becomes ulcerated and large pieces of it may slough off altogether.

In the case of young pigs the disease is often fatal, but the older ones usually recover.

Control.

At the present time it is difficult to recommend any efficient method of treatment or control. Howarth, of the Californian Agricultural Experiment Station, recommends the incision of the castration swelling, or removal of the masses of dead flesh from the skin lesions; then dusting the cavity or skin lesions with a substance called tartar emetic. The inside of the cavity or the surface of the skin lesions should be covered with powder, but care should be taken in the case of castration wounds not to leave an excess of the powder in the cavity, lest absorption and poisoning should occur.

The disease is generally though not always associated with dirty, unhygienic, and badly managed piggeries.

In view of this and the fact that the disease is caused by a specific germ, the following control measures should be adopted:—

1. Isolate all pigs affected with the disease.

2. Clean and disinfect the yards, houses, troughs, &c., and keep them clean.

3. Do not use wallows or badly drained sties. Suckling sows and litters more especially should not be allowed access to mud and filth as the disease is particularly serious in young pigs.

4. Be particularly clean in the operation of castrating and keep the castrated pigs in a scrupulously clean place until the wounds have healed.

5. Discontinue the use of barbed wire about the yards, as this often produces wounds through which the germs may enter.

6. If lice are present apply crude oil to the skin of the pigs to destroy these parasites.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Litter Recording of Pigs.

SOME pig raisers are now carrying out litter recording and the results obtained are considered most valuable. The records of two litters, which were officially checked by officers of the Department recently, are so good that they should be interesting to all pig raisers.

Litter Record.

Owner—Hibberd Bros., "Grenier Park," Gold Creek, Indooroopilly.
Dam of Litter—"Gatton Pet,"—Large White.
Sire of Litter—"Norfolk Barron 2nd,"—Large White.
Litter Born on 21st February, 1935.

Tattoos.	40	41	42	43	44	45	46	47	48	49	50	51	52	53	Total.	Average.
Sexes.	B	B	B	B	S	S	S	S	S	S	S	S	S	S		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Weight at birth ..	3	3	2	2	1½	1½	2	2	2½	3	2½	3	3	3	34	2·4
Weight at 1 week	8	6½	4	4½	*	*	4½	3½	5	6	5	7	6½	6½	67	5·5
Weight at 2 weeks	14	10½	6	10	..	..	7	8½	9	9	8	10	9½	12	113½	9·4
Weight at 3 weeks	16½	13½	9½	10½	..	..	10½	8½	10½	13½	11½	13½	13½	13½	145	12·0
Weight at 4 weeks	19½	17½	12	14½	..	..	14	10½	13½	15½	13½	18½	16½	18	183½	15·3
Weight at 5 weeks	28	23	15½	20	..	..	17	14	17½	21	19	21	22	24½	242½	20·2
Weight at 6 weeks	34	28	17	26	..	..	21	18	21½	26	23	26	26½	29	296	24·6
Weight at 7 weeks	45½	39½	24½	33½	..	..	27	24½	30	32½	28	34½	32½	37½	389½	32·5
Weight at 8 weeks	53	47	29	41	..	..	34	29	37	38	36	42	41	46	473	39·4

* These pigs died on 22nd February, 1935.

Total Litter Weight at 8 weeks:—473 lb.
Average weight per pig at 8 weeks:—38·6 lb.
This was the sow's second litter, she having reared 10 pigs in her first litter.

Litter Record.

Owner—H. O. Rees, "Cethor" Stud, Maleny.
Dam of Litter—(Unnamed)—Middle White.
Sire of Litter—"Gladesville Prince"—Middle White.
Litter born on 21st February, 1935.

Tattoos.	19	20	21	22	23	24	25	26	27	28	Total.	Average.
Sexes.	B	B	B	B	B	B	B	S	S	S		
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Weight at birth	3	3	2½	3	2½	2	1½	3	3	3	26½	2·6
Weight at 1 week	6	7	5	6	5	5	4½	6	6	6½	57	5·7
Weight at 2 weeks ..	8	10½	7½	9	8	7	6½	9½	8½	9	83½	8·3
Weight at 3 weeks ..	10	14	11	13	11	10	9	13	12	12	115	11·5
Weight at 4 weeks ..	15	20	17	19	16	14	14	19½	16½	18	169	16·9
Weight at 5 weeks ..	20½	26	24½	21½	21½	17½	19½	26½	21½	21	220	22·0
Weight at 6 weeks ..	26	31	31	29	27½	23	23½	32½	28	26½	278	27·8
Weight at 7 weeks ..	31	36	38	34	33½	28	28	38	31	33	330½	33·0
Weight at 8 weeks ..	37	42	42	43	39	33	32	44	36	38	386	38·6

Total Litter weight at 8 weeks:—386 lb.
Average weight per pig at 8 weeks:—38·6 lb.
This was the sow's first litter.

Field Day for Dairy Farmers

Gathering at Glencoe.

THE initial field day for dairy farmers of the Darling Downs was organised by the Glenorie Local Producers' Association under the Dairy Committee Scheme of the Dairy Cattle Improvement Act on the 16th April, at the farm of Mr. W. F. Kajewski, at Glencoe.

Among the fifty farmers present were representatives of the Glenorie, Kingsthorpe, Yalangur, and Boodua Dairy Committees.

A feature of the day was the parade of Mr. Kajewski's well-known A.I.S. herd. It included the head sire of his stud, the cows which were champions at Toowoomba Shows for 1934 and 1935, heifers which have been prize-winners at Downs Shows, and a number of splendid young stock. Not only are the animals prize-winners, but they have shown their worth in production by their entry into the advanced register of the A.I.S. Society.

Mr. C. F. McGrath, Supervisor of Dairying, outlined the objects of the Dairy Cattle Improvement Board in instituting field days and the lessons that can be learned from them.

He also ably demonstrated the points that a judge considers when cows are in the show ring, and by using several cows from the herd showed where they differed and how they would be placed if in competition.

Mr. O. St. J. Kent, Dairy Science Officer, gave an address on dairy hygiene. He dealt principally with the importance of cleanliness in the production of milk, and the care of cream on the farm in relation to quality in butter.

Demonstrations with the microscope revealed various organisms which have a harmful effect on dairy products.

Mr. G. B. Gallwey, Inspector of Accounts, spoke on marketing and allied subjects. Special attention was given to over-run and the factors which govern it. The operations of the Commonwealth Stabilisation Scheme were outlined.

Diagrams showing the imports of the various countries to Great Britain and the production and sales of the Australian States were explained.

Mr. C. R. Mulhearn, Veterinary Officer, gave an address on Mammitis and held a post-mortem examination on a cow. He explained the functions of the organs of the animal, pointing out where and what to look for in the common diseases of dairy stock. Many questions were asked and satisfactorily answered.

At the conclusion of the day Mr. W. Dearling, on behalf of the Glenorie L.P.A., thanked the officers of the Department for their attendance and the valuable and interesting information which they had imparted to those present. He also thanked Mr. Kajewski for allowing the L.P.A. to use his farm.

Mr. J. C. Brimblecombe, on behalf of the other L.P.A.'s, expressed appreciation of the fact that the Department had officers who were not only versed in the theory of their subjects but could carry out the practical work as well.

Mr. McGrath returned thanks and said that the Department was always willing at any time to render assistance to the farmer.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, production charts for which were compiled for the month of March, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Lucky 2nd of Wendella (365 days)	J. Phillips, Wondai	16,930·34	711·712	Daisy's Westbridge of Glenthorn
Glenlee Moreen	R. Martin, Coalstoun Lakes	12,948 00	614·484	Perfection of Springdale
Upton Pidgeon 16th	H. F. Marquardt, Wondai	14,253·87	518·695	Kinsman of Greyleigh
Ada II. of Rockleigh	T. S. Strain, Wondai	11,043·94	451·099	King of Sunnyside
Happy Valley Myrtle 3rd	R. R. Radel, Coalstoun Lakes	9,631·00	394·767	Chief of Hillview
Valencia Dahlia	W. Turner, Riverleigh	9,633 5	390·5	Young Challenger of Blacklands
Rhodesview Nancy 5th	W. Gierke & Sons, Helidon	9,555·32	389·00	Birdwood of Blacklands
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Alfavale Model II.	W. H. Thompson, Nanango	12,229·6	561·433	Reward of Fairfield
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Wandegong Daisy	G. D. Lindenmayer, Mundubbera	11,552·75	396·337	Emperor of Spurfield
Aurora Johnny	Mrs. L. J. McCauley, Mundubbera	8,486·25	341·201	Jeans Reflex of Blacklands
SENIOR 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Sunnyview Evelyn II.	J. Phillips, Wondai	12,994·29	483·603	Lovely's Commodire of Burradale
Rocklyn Daphne	T. S. Strain, Wondai	10,196·61	398·877	King of Sunnyside
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Ruby VII. of Lemon Grove	J. Phillips, Wondai	11,677·03	528·63	Don of Greyleigh
Morden Favourite 6th	R. Mears, Toogoolawah	10,751·3	442·476	George of Nestles
Miss Jean 7th of Blacklands	A. Pickels, Wondai	9,415·89	324 903	Major of Blacklands

	SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.			
Rhodesview Fanny 20th	W. Gierke & Sons, Helidon	8,342·85	331·669	Blackland's Prospector
Trevor Hill Snowball	G. Gwynne, Umbiram	6,532·1	262·065	Viceroy of Wilga Vale
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.			
Rhodesview Kitty 7th	W. Gierke & Sons, Helidon	8,360·53	354 243	Blacklands Prospector
Trevor Hill Marigold	G. Gwynne, Umbiram	7,945·6	332·149	Viceroy of Wilga Vale
Chelmer Dahlia	H. F. Marquardt, Wondai	8,428·94	322·303	Gordon of Swanlea
Ettie 8th of Blacklands	A. Pickels, Wondai	9,046·34	319·122	Major of Blacklands
Hillfield Dulcie 3rd	S. J. Lester, Roadside	6,543·01	272·497	Mountain Home Royalist
Rocklyn Pearl	J. Reeves, Kingaroy	6,302·4	251·819	Oakvilla Don
Springland's Rosebud 4th	J. Reeves, Kingaroy	6,653·9	249 852	The Hill Hollywood
	JERSEY.			
	MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.			
Bellefaire Claire de Lune (365 days)	J. B Keys, Gowrie Little Plains	11,537·16	630 086	Masterpiece Yeribee of Bruce Vale
Petal of Linwood	F. W. Kath, Ellesmere	7,020·5	436·809	Aerofoil of Banyule
	SENIOR, 2 YEARS (OVER 2½ YEARS). STANDARD 250 LB.			
Glenview Starlight	F. P. Fowler & Sons, Biggenden	6,115 00	364·496	Trinity Officer
Inasfayl Fancy Larkspur 2nd	McGeehan Bros., Kairi	5,860 05	322·277	Werribee Starbright's Masterpiece 2nd
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Woodside Volunteers Countess	J. & R. Williams, Crawford	8,923·45	425 467	Rochette's Volunteer
Inasfayl Golden Maid	McGeehan Brothers, Kairi	6,482 95	296 819	Inasfayl Wyandotte's Noble
Kathleigh Pearl	D. Young, Kingaroy	5,757 55	291·604	Aerofoil of Banyule
Rosette of Curramore	R. M. Burnett, Maleny	5,178 45	281 546	Mannie of Curramore
Wyreene Ria	J. B. Keys, Gowrie Little Plains	4,299·6	253·199	Lyndhurst Majesty
Oxford June	W. Spresser & Son, Redbank	4,044 55	242·32	Oxford Ginger Boy
Carnation Fairy Lass (267 days)	W. Spresser & Son, Redbank	3,984·75	235 848	Vencheley Golden Victory (imp.)

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesday and Thursday of each week, as from the 2nd April, 1935, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for April, May, and June, 1935:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 14th May, 1935—"The Farmers' S.O.S.—'Save Our Soil,'" by J. F. F. Reid, Editor of Publications.

Thursday, 16th May, 1935—"General Problems in Plant Breeding in Queensland," by L. G. Miles, B.Sc., Ph.D., Plant Breeder.

Tuesday, 21st May, 1935—"Recording Pig Production," by L. A. Downey, H.D.A., Instructor in Pig Raising.

Thursday, 23rd May, 1935—"Housing and Management of Pigs," by L. A. Downey, H.D.A., Instructor in Pig Raising.

Tuesday, 28th May, 1935—"The Prospects of Success with English Type Sheep in Queensland," by J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 30th May, 1935—"Frost Prevention by Orchard Heating," by H. Barnes, Director of Fruit Culture.

Tuesday, 4th June, 1935—"Grading Pig Products," by E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Thursday, 6th June, 1935—"Tropical Fodders—No. 1 Grasses," by C. T. White, Government Botanist.

Tuesday, 11th June, 1935—"Tropical Fodders—No. 2 Herbage," by C. T. White, Government Botanist.

Thursday, 13th June, 1935—"Shade Trees," by W. D. Francis, Assistant Botanist.

Tuesday, 18th June, 1935—"Some Native Grasses," by S. L. Everist.

Thursday, 20th June, 1935—"Artificial Incubation," by P. Rumball, Poultry Expert.

Tuesday, 25th June, 1935—"Queensland Nut Growing," by H. Barnes, Director of Fruit Culture.

Thursday, 27th June, 1935—"Citrus Culture," by H. Barnes, Director of Fruit Culture.

CAUSE OF CREAM CONTAMINATION.

Many a dairy farmer has been at a complete loss to understand the cause of a drop in the quality of his cream until he has brought the matter under the notice of the local dairy instructor.

A supplier to the Bellinger River Co-operative Factory (N.S.W.) was at a loss to know why his cream was being graded down. He had investigated the usual causes of cream contamination, but none of these provided a reason for the trouble. The matter was then investigated by the local dairy instructor, who found a very small crack in the separator milk float. This was so small as to go unnoticed, but it had allowed the milk to enter and putrify in the interior of the float. As a matter of fact, the float was almost full of a wet putrid mass, which, of course, was a fruitful source of contamination of the cream.

And the moral of this story is not so much to invite every dairy farmer to break open his separator milk float, as to invite them to seek the aid of the district dairy instructor when experiencing trouble in the maintenance of cream quality.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Grease Nut.

J.E.S. (Muan, Gayndah Line)—

Your specimen represents the Grease Nut (*Hernandia bivalvis*), a native of the scrubs of Southern Queensland. The tree apparently is not abundant anywhere, but seems to be most common in the scrubs about Biggenden. The seeds contain nearly 50 per cent. of a bitter oil. This oil has been examined chemically, but is not known to possess any commercial possibilities. The tree is well worth growing on account of its ornamental character.

Blue Grass, Barley Grass, and Small Flinders Grass.

V.W. (Macalister)—

1. *Dichanthium sericeum* (Queensland Blue Grass).—One of our best native grasses. The principal grass of the Leichhardt district.
2. *Panicum decompositum* (Barley Grass).—Regarded as good fodder only when very young. It soon becomes dry and unpalatable. The seed heads break off and blow away, hence one of its local names—Blow-away Grass. This name, however, is applied to a number of different grasses whose seed heads show the same tendency.
3. *Bothriochloa erianthoides* (Satin Top).
4. *Iseilema membranacea* (Small Flinders Grass).—An annual grass which comes away quickly after rain. Relished by stock even when quite dry.
5. Better material required for identification.

Wheel-O'-Fire.

H.F.M. (Dayboro')—

Your specimen represents *Stenocarpus sinuatus*, the Wheel-of-Fire, a native of the Northern Rivers of New South Wales and coastal Queensland. In this State it stretches from the Tweed River to the Cairns timber district. It is one of the most handsome of our native flowering trees, and is especially valuable as the flowers lend themselves so well to design. It belongs to the Silky Oak family (*Proteaceæ*) and has a silky-oak grain but paler than that timber.

Tie Bush.

W.T.M. (Nudgee)—

Your specimen is the Tie Bush (*Wickstroemia indica*), a plant with a very evil reputation in Queensland. Feeding experiments were carried out with it some years ago at the Animal Health Station, Yeerongpilly, but the animals experimented with (heifers), although very emaciated and passing bloody scours, recovered when put on to ordinary feed. A few years ago, however, specimens of the berries were received from Nambour with the report that they had fatally poisoned a child in the neighbourhood. Feeding experiments with the berries were conducted on guinea pigs, and proved that they were highly poisonous. We remember in the first experiment the plant was in flower only, so probably it is the berries that are the poisonous part of the plant. The eradication of the plant is certainly recommended.

Black Wattle. Quinine Berry.

J.D. (Chinchilla)—

The specimens represent—

1. *Acacia Cunninghamii*, the Broad-leaved Wattle or Black Wattle;
2. *Petalostigma quadriloculare*, Wild Quinine or Quinine Berry.

These two trees are very common over a very extensive range in Queensland, both on the coast and inland, and we never saw them eaten by stock—that is, in any quantity. One might see an occasional sucker of wattle eaten down. Neither of them are known to possess any harmful properties. Both, particularly the wattle, could be used as an emergency food.

Russell River Grass. Mat Grass.

A.O. (Peachester)—

The grass with the small dark seed heads is *Paspalum paniculatum* (Russell River Grass), widely spread over most tropical countries. It is very common in North Queensland, but is rarely seen down south. It was boomed a good many years ago as a fodder, particularly for dairy cattle, but has since gone quite out of favour. It has a very poor reputation in North Queensland, but it is very abundant in some parts, and during the season horses greedily eat the seed heads, and are said to do remarkably well on them, being just like corn-fed animals.

The other grass is *Axonopus compressus* (Narrow-leaved Carpet Grass or Mat Grass), a common tropical grass of some value on second-class country. It has a great disadvantage, however, of invading better class paspalum pastures, very much reducing their value for dairying purposes.

Waddy Wood.

C.J.G. (Mapleton)—

The specimen of wood represents *Trochocarpa laurina*, a small tree fairly common in coastal Queensland and with a wide distribution. The only local name we have heard applied to it is waddy wood. It is rather an anomalous member of the Australian heath family (*Epacridaceæ*), and we have never noticed the peculiar lime or citrus smell mentioned by you. It is quite distinct from *Backhousia citriodora*, though this latter probably grows in your district. We have seen it in moderate abundance at Candle Mountain, west of Beerwah, and in less abundance in coastal, sandy, rather thick forest towards Noosa. *Backhousia* also grows very often on the coast on rather muddy flats.

T.T. (Birkdale)—

Your specimen has been determined as *Capillipedium parviflorum*, (Scented Beard or Scented Top), a very common grass in forest country in Queensland. It is quite a good grazing grass.

Russian Thistle. Creeping Saltbush.

C.E.E. (Killarney)—

1. *Salsola Kali* (Russian Thistle), a species of Roly Poly. Eaten by stock in the very young stages, but, generally speaking, rejected by them when older. When the plant is in seed, however, horses are very fond of the seed heads. We have no records of the effects of this plant on milk and cream.
2. *Atriplex semibaccata* (Saltweed or Creeping Saltbush), one of the best of the saltbushes. Very abundant on the Darling Downs and Western Queensland generally. We have had no experience of its effect on milk and cream, but think it would give it rather a strong weedy flavour.

   We do not known if either of these plants would cause milk to ferment quickly.

Rib Grass. Crowsfoot Grass.

J.S. (Chinchilla)—

1. *Plantago lanceolata* ("Rib Grass"). Mostly found in Queensland as a weed of cultivation, or where the ground has been disturbed, rather than as a herb in the ordinary pasture. It is sometimes recommended for sowing in pasture mixtures. Personally, we have not seen stock eat it to any great extent.
2. *Eleusine indica* (Crowsfoot Grass). Not to be confused, of course, with the herbage called Crowsfoot that is very common on parts of the Darling Downs and in the Maranoa district. Analysis shows this grass to be very nutritious but, like young sorghums, it contains a prussic-acid-yielding glucoside, and if eaten in any quantity by hungry stock on an empty stomach trouble may ensue. Very little trouble has been experienced with the plant in Queensland, and, on the whole, ordinary paddock stock feed on it with impunity. It mostly occurs as a weed of cultivation or in places where the ground has been disturbed rather than as a grass of the ordinary pasture.

Broad-leaved Carpet Grass.

B. (Brisbane)—

The grass is *Axonopus compressus* (Broad-leaved Carpet Grass). This grass is common in most warm countries and occurs in Queensland in two forms—a narrow-leaved form and a broad-leaved form. The latter—the one you send—is generally regarded as the better of the two. It has quite a good value as a grass for second-class country, but has the disadvantage that it may invade paspalum pastures in scrub country, and almost ruin them from the point of view of a dairy pasture. In America this grass is spoken very highly of as a fodder, but our experience with it here is that it is of only very moderate quality.

Paspalum Urvillei.

W.J.C. (Childers)—

The specimen represents *Paspalum Urvillei.* This grass was boomed as a fodder some years ago under the name of *Paspalum virgatum,* but has now gone entirely out of favour. It is a native of South America, but is now quite common in some parts of Queensland, particularly on some of the second-class country along the North Coast Line between Brisbane and Gympie. So far as our experience goes, however, although it is a luscious-looking grass, stock do not take readily to it. In fact, we have heard of cases where almost starving cattle would hardly look at the grass. The class of country on which it grows, of course, might affect its feeding value, and it might be somewhat more palatable on your country than on the coast.

Grasses from Central Burnett Identified.

F.A.S. (Mundubbera)—

1. *Bothriochloa intermedia* (Forest blue grass).—In Central Queensland this is looked upon as an excellent fodder grass.
2. *Alloteropsis semiolata* (Cockatoo grass), with a few specimens of *Digitaria* sp.
3. *Panicum decompositum,* sometimes known as barley grass.
4. *Sporobolus elongatus* (Rat's tail grass).—An inferior species.
5. *Chloris divaricata.*—A native grass which has possibilities as a pasture grass, and also for lawns.
6. *Eriochloa* sp.—Most of the *Eriochloa* grasses are good fodder grasses.
7. *Aristida glumaris.*—A three-pronged or three-awned spear grass.
8. *Cymbopogon refractus* (Barbed-wire grass).
9. *Themeda australis* (Kangaroo grass).—Eaten by stock when young, but becomes rather coarse and unpalatable when mature.
10. *Dichanthium sericeum* (Blue grass).—A number of forms of this grass are found in Queensland. They are all excellent pasture grasses.
11. *Bothriochloa decipiens.*—Bitter or pitted blue grass or red leg. This is a very inferior grass which has considerably reduced the carrying capacity of some coastal pastures in Queensland and New South Wales.
12. *Eragrostis parviflora* (Weeping love grass).
13. *Rhynchelytrum repens* (Red Natal grass). Of little use for fodder, except when cut up and made into "chop-chop."
14. *Chloris ventricosa.*
15. *Capillipedium parviflorum* (Scented top or scented golden beard).—In the Rockhampton district this is looked upon as an excellent pasture grass.
16. *Arundinella nepalensis.*
17. *Aristida ramosa.*—A three-pronged or three-awned spear grass.
18. *Heteropogon contortus* (Bunch spear grass).—This is quite good fodder when young, but the sharp seeds are dangerous when the grass is mature.
19. *Imperata cylindrica,* var. *Koenigii* (Blady grass).
20. *Eragrostis cilianensis* (Stink grass).—Usually found as a weed of cultivation, along roadsides, &c. It is not usually looked upon as of any value, although working horses have been said to eat it.
21. *Setaria surgens.*
22. *Leersia hexandra* (Rice grass).
23. *Eragrostis* sp.—A species of love grass.

24. *Eragrostis leptostachya* (Paddock love grass). A useful grass in the average native mixed pasture.
25. *Tragus racemosus* (Small burr grass).—Regarded by sheepmen in the West as quite a good fodder, though the burrs are a nuisance in wool.
26. *Eleusine indica* (Crowsfoot grass), usually met with as a weed of cultivation, along roadsides, &c. Stock seem fond of it, and its food value is high. However, it contains a prussic-acid-yielding glucoside, and if eaten in quantity by hungry stock would probably cause trouble.
27. *Digitaria marginata* (Summer grass).—A weed of cultivation.
28. *Chloris virgata* (Feather top grass), also known as feather top Rhodes grass, a grass closely allied to Rhodes grass, but much inferior to it as a fodder. Stock seldom touch it, except when it is made into hay.
29. *Echinochloa colona* (Barnyard millet).—Usually found in damp situations, or as a weed of cultivation. It is closely allied to the cultivated fodders Japanese millet and white panicum, and should be quite a good fodder.
30. *Cyperus gracilis.*—A sedge, not a true grass.
31. *Cyperus iria.*—A sedge, not a true grass.
32. *Fimbristylis diphylla.*—A sedge, not a true grass.
33. *Fuirena glomerata.*—A sedge, not a true grass.
34. *Cyperus polystachyus.*—A sedge, not a true grass.
35. *Juncus communis.*—Not a grass, but a rush.
36. *Eriochloa* sp.
37. *Eragrostis Brownii* (Love grass).
38. *Cleistochloa* sp.
39. *Cleistochloa subjuncea.*
40. *Dichanthium sericeum* (Blue grass).—One of the best of our native grasses.
41. *Eulalia fulva* (Brown top grass).—Has a fairly good reputation as a fodder.
42. *Cymbopogon* sp.
43. *Stipa verticellata* (Cane grass or bamboo grass).—A coarse grass of little value as a fodder.
44. *Eriachne* sp.
45. *Eriachne* sp. } The genus *Eriachne* is under revision by Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, so that we cannot give you specific names for these.
46. *Schizachyrium obliquеberbis.*
47. *Eragrostis parviflora* (Weeping love grass).—A native grass about whose fodder value little is known. It should prove quite useful however.
48. *Pappophorum Lindleyanum.*
49. *Pappophorum nigricans* (White heads).—Not regarded as of much consequence from the point of view of pasture.
50. *Triraphis mollis.*—Common in sandy situations. Not regarded as a very good fodder.
51. *Perotis rara* (Comet grass).—A native grass common in sandy situations. It is not looked upon as of much value as a fodder.
52. *Digitaria Brownei.*
53. *Digitaria* sp.
54. *Digitaria* sp.
55. *Stenophyllus barbatus.*—A sedge, not a true grass.
56. *Fimbristylis vaginata.*—A sedge, not a true grass.
57. *Sorghum halepense* (Johnson grass).—A serious pest in cultivation. Its long underground rhizomes make it very difficult to eradicate.
58. *Echinochloa Walteri.*—A grass usually found in damp situations. It is closely allied to the cultivated fodders Japanese millet and white panicum, and should be quite good fodder.

Pigweed.

J.G. (Fernlees)—

Pigweed has several times been accused of poisoning stock in Queensland, but it is not known to possess any poisonous properties, and we think in all cases death can be attributed to bloat or hoven.

Identification of Grasses.

F.W. (Wandoan)—

We have no complete publication dealing with the grasses of Queensland. "The Grasses and Forage Plants of New South Wales," by E. Brakewell, price 6s. 6d. posted, obtainable from the Government Printer, Sydney, New South Wales, you may find useful. Although it deals principally with New South Wales grasses, most of those described in the book occur in Queensland. We would be pleased, however, to identify, and report on, any specimens of grasses or other plants you care to forward. Of grasses, a few seed-heads and a stalk, doubled up so as to be rolled comfortably in a small piece of newspaper, should be sufficient. When more than one specimen is sent, each specimen should be numbered and a duplicate retained, when names and reports corresponding to the numbers will be returned. If desirous of a quick reply, it is not advisable to send, say, more than ten specimens at one time.

General Notes.

Sugar Experiment Stations Acts.

All existing regulations under the Sugar Experiment Stations Acts have been rescinded, and new regulations, embodying many of the provisions of the old regulations, together with provision for meetings of the Sugar Experiment Stations Advisory Board and the conduct of business thereat have received executive approval.

Plywood and Veneer Board.

Notice of intention to extend the operations of the Plywood and Veneer Board for the period from 3rd May, 1935, to 2nd May, 1936, was published in the "Government Gazette" of the 19th January. No petition was received up to 15th February last on the question of the extension of the Board, and an Order in Council formally extending it for the period abovementioned has been issued. The Board applies to that portion of the State south of the twenty-third degree of south latitude.

QUEENSLAND SHOW DATES, 1935.

May.

Barcaldine, cancelled.
Kilkivan, 20 and 21.
Roma, 21 to 23.
Ipswich, 21 to 24.
Biggenden, 23 and 24.
Gympie, 24 and 25.
Toogoolawah, 24 and 25.
Dirranbandi, 24 and 25.
Kalbar, 25.
Maryborough, 28 to 30.
Biloela, 30 May to 1 June.

June.

Gin Gin, 1 to 3 .
Marburg, 1 to 3.
Childers, 3 and 4.
Emerald, 5 and 6.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Warrillview, 8.
Boonah, 12 and 13.
Gladstone, 12 and 13.
Gayndah, 12 and 13.
Esk, 14 and 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Kilcoy, 11 and 12.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.
Nambour, 18 to 20. Campdraft.
Cairns, 23, 24, 25.
Atherton, 30 and 31.
Gatton, 31 July and 1 August.

August.

Gatton, 31 July and 1st August.
Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.
Home Hill, 30 and 31.

September.

Imbil, 6 and 7.
Esk Carnival and Campdraft, 6 and 7.
Pomona, 13 and 14.
Tully, 13 and 14.
Innisfail, 20 and 21.
Beenleigh, 20 and 21.
Rocklea, 14.
Kenilworth, 28.

October.

Malanda, 2 and 3.

Rural Topics.

Milk Distribution in New Zealand.

Discussing at the Southern District conference of the Agricultural Bureau of New South Wales some impressions of dairying in New Zealand gathered during a recent visit with a party of New South Wales farmers, the senior departmental dairy instructor located at Wagga gave some interesting facts concerning the Wellington municipal milk depot.

The central distributing plant, it was stated, was housed in a prominent brick building, the main dairy room being 195 by 98 feet and elaborately tiled in white. In this were the bottle-washing and bottling sections, surrounded by an elevated inspection gallery on which also were situated the milk-holding vats and pasteuriser. The milk was pumped to the chilled holding tanks from where it was fed to the pasteuriser and heated to 145 to 150 degrees Fahr., being held at that temperature in a special holding vat for thirty minutes. From there it gravitated over a brine cooler situated in a dust-proof room and then by gravity was fed to the bottling machines of which there were four, each pair capable of bottling 130 bottles per minute. Bottles were washed and sterilised in a machine capable of handling 8,000 bottles an hour.

The operatives, who changed into clean uniforms daily, had their own mess room, recreation room, and superannuation scheme.

The temperature of Wellington was rarely over 80 deg. Fahr., and deliveries were made in open carts, which were fed by motor lorries, under which system each man could deliver about 90 gallons daily.

The milk was subjected to rigorous tests for quality, and payment was made according to quality and fat content, and was based on one-quarter of London parity for butter, one-quarter of local price for butter, and one-half London parity for cheese. To this basic price was added a premium of about 2d. a gallon to cover the cost of licensing, upkeep, loss of by-products, &c. In the winter a premium of 85 per cent. of the summer price was paid. The average return to the farmers was approximately 11d. per gallon, while the average retail selling price was 1s. 10½d. per gallon. Second-grade milk was paid for at 1d. less than first grade and without premium. The average quantity graded down was about 5 per cent.; 5,000 gallons were treated daily, and a profit of some £7,000 a year was made.

A token system of payment was used with great success. Small metal tokens distributed by agencies were bought in numbers at a discount by householders, and these tokens were left out with the milk jug, thus eliminating bad debts.

Wellington had certainly set a standard in milk supply that was a model for any city.

Laying Out an Orchard—Contour Planting.

When laying out a new orchard on sloping ground serious consideration should be given to the prevention of soil erosion, and the plan which offers the best solution of this problem is to plant on the contour with a slight fall in one direction. When this is done the ploughing and cultivation can follow the contour, and each plough and cultivator track will act as a minature contour drain, thus, to a great extent, keeping the water spread—not allowing it to concentrate at any point. A slight bank can be thrown up along the line of trees, also acting as a contour drain of larger capacity.

And as an added precaution should an extraordinary downpour occur, a bigger bank at intervals is advocated—the frequency of these depending on the fall of the slope being planted. A wider space between the lines of trees would be necessary where these larger banks are located to allow for their formation.

Contour planting is quite suited to commercial orchards. It offers no difficulties to carrying out the ordinary orchard operations, except to a very slight extent when ploughing. The trees along the contour lines can be planted at the required regular distance, but the contour lines may not be parallel, so that when ploughing, the distance between the rows of trees will be slightly wider in some places than in others. An experienced ploughman would quite easily overcome this difficulty, and the slight inconvenience is insignificant when compared with the damage to the trees from the loss of soil.

As a matter of fact, on a fairly even slope it is possible, by modifying the grade of the contour lines to a slight extent and by some banking, to keep groups of lines of trees very little out of parallel.—A. and P. Notes, New South Wales Department of Agriculture.

Points in Dairy Practice.

Maize or sorghum silage is best fed to dairy cows with lucerne hay at the daily rate of 3 lb. silage and 1 lb. lucerne hay for each 100 lb. body weight of the cow. Concentrates may be added to the ration, a mixture being preferable to a single concentrate. Cracked or crushed grain, bran, pollard, linseed meal, and copra cake are suitable for this purpose.

A concentrate mixture may be fed according to the yield of the cow and the amount of pasture available. Under bad winter conditions, a full daily ration would be completed by adding to the silage and hay 1 lb. of a concentrate for each—

3 lb. of Jersey milk produced per day.
3½ lb. of Shorthorn milk produced per day.
4 lb. of Holstein milk produced per day.
1 lb. of butter-fat produced per week.

Thus a full ration for a Shorthorn cow weighing 1,100 lb. and producing 21 lb. of milk per day would be—

33 lb. silage.
11 lb. lucerne hay.
6 lb. concentrates.

At Hawkesbury Agricultural College it is found that the following make good mixtures:—

For Winter.	lb.
Maize silage	25
Green barley	25
Lucerne chaff	6
Cocoanut oil cake	2
Linseed meal	1½
Bran	3

If green barley is not available, 30 lb. of maize silage and 10 lb. of lucerne hay may be given—

For Summer.	lb.
Maize silage	25
Green maize	25
Lucerne hay	10
Bran	2
Linseed meal	2

Oaten and wheaten chaff can also be fed in conjunction with silage, but more concentrates should be used.

The average quantity of silage consumed per cow at the College during the winter months is 30 lb. per day.

The only care to be taken in feeding silage is not to overfeed bulls. The maximum amount that a bull should receive is 15 lb. a day.

Cows and Sheep—An Unusual Combination.

The Government Sheep and Wool Expert (New South Wales) is of opinion that fat lamb raising could be made a profitable sideline to dairying on some of the lighter undulating country on the North Coast (N.S.W.). He was referring in particular to the Wingham district, which he inspected quite recently. Anyone launching out in this sideline in that locality would be considerably advantaged by the fact that the Wingham bacon factory has facilities for killing and handling the carcasses, and consequently there would be no loss of weight or bloom.

A conservative estimate of returns per year from a flock of fifty ewes was as follows:—Wool (6½ lb. per head) at 10d. lb., £13 10s. 10d.; lambs, 40 at 15s. per head, £30, making a total of £43 10s. 10d. per year.

A certain amount of disease, particularly worms, would be experienced, and those running the sheep would have to be prepared to drench systematically.

The lambing would have to be arranged to take place at the best season of the year, when up to five months good feed conditions could be expected. Furthermore, the lambing must be restricted to a reasonably short period. This would mean keeping the rams away from the flock, except for, say, a two-months mating period. Only pure bred rams should be used.

Trees on the Farm.

Where trees are to be planted together, such as for windbreaks or avenues, the land should be first ploughed. New land should be broken up before winter and allowed to lie until planting time. A plan which has its advantages is to make the first ploughing only deep enough to cover the grass and herbage. Shortly before planting the ground should be cross-ploughed deeply, and then harrowed. Ground previously under crops would probably contain many weed seeds, and to enable the young trees to become established before the weed growth becomes unduly aggressive such land should be ploughed and harrowed, and planted immediately afterwards with the trees. Where hillside planting is being carried out, the ploughing should follow the contour of the hills as far as possible.

Ordinary hole planting is attended with some risks, especially where the subsoil is impervious. In such cases the hole tends to become merely a pool of stagnant water and a grave for tree life. Where trees must be planted in holes, such as in the case of isolated shade, shelter, and ornamental trees, the holes should be made as large as possible. A hole 3 feet by 3 feet and 2 feet deep is the smallest size allowable, and larger holes, where possible, should be made.

Where deep digging carries the hole into an impervious subsoil, it is better to make the hole wide and shallow, the depth not exceeding that of the soil. On wet, poorly-drained soil, ridges or mounds may be formed as sites for planting. Ploughing two adjoining furrows so as to throw the sods together achieves this end in a minor way. Irrespective of what method is adopted, the preparation of the land should be completed before stock for planting is obtained.

The best time for planting is when the plant is at its resting period, and when moist, cool conditions prevail. Generally speaking, May to August are the best months. The effects of frosts must be studied, and spring planting is often necessary in some localities, except for deciduous species. Where the rainfall is heavy and conditions generally are cool, the planting period may be considerably extended. A cool, cloudy day and a fairly moist soil provide ideal conditions.

Maize as Stock Feed.

It is extraordinary how often the disposal of the grain on the open market is regarded as the only source of income from maize. Its utility on the farm is not sufficiently realised. In the United States, the greatest maize-producing country in the world, over 85 per cent. of the crop is fed to live stock in some form or another, and growers constantly keep in mind the fact that live stock will probably be the ultimate market for the crop. The American maizegrower, therefore, is chiefly concerned in producing the highest number of pounds of live stock per acre at the least cost of human labour, and in the development of the maize industry in New South Wales, this will be a problem of first importance.

While conditions in the U.S.A., with its millions of population, may not be wholly comparable with our own, the fact remains that maize should be utilised much more extensively as feed for pigs and dairy cows, particularly the latter, to maintain the milk flow in winter months. A South Coast dairyman recently recorded an increase of 22½ per cent. in the quantity of milk produced by adding 2 lb. crushed maize per day to a ration of lucerne and silage, giving a market value to the maize of approximately 6s. per bushel.

Although in total food production per acre, and as a fattening agent maize has no superior, the grain is somewhat low in protein, and deficient in vitamin A, and it is necessary at all times to supplement rations with feeds which will make up for these deficiencies. This is readily available on the farm in some form of green fodder, leguminous for preference. Fortunately, the value of green maize as fodder is well known, and its conversion into ensilage is becoming every year more popular on coastal dairy farms.

For pig fattening maize is invaluable, and with pork selling at a reasonable figure the return per bushel is invariably better than the open market price for grain; for example, it has been estimated that with pork at 4½d. per lb., maize grain fed with other suitable feeds has a value of 4s. 2d. per bushel, on the basis of approximately 9 bushels of grain producing 100 lb. of pork.—"Agricultural Gazette" of New South Wales.

Evolution of Hornless Cattle.

In the *New Zealand Farmer* for April, Primrose McConnell discusses under the caption "How Breeds of Purebred Hornless Cattle are Bred Up from the Horned," a subject of great interest to Queensland stockowners. A farmer correspondent had written to him as follows:—"I have had an argument with a friend over the dehorning of cattle, and I shall be very glad to have your opinion on the matter through the columns of the *Farmer*. My friend maintains that if cattle are regularly dehorned, year after year, they will eventually become hornless, naturally. I feel sure that this is not correct, and we have its incorrectness well demonstrated in the docking of lambs, an operation that has been carried out for a great many years without any shortening of the newly-born lambs' tails. Will you also kindly state how the hornless breed of Shorthorns and Herefords were originated."

Primrose McConnell gave the following reply:—

"At a superficial glance these queries may not seem of great importance, but I am of the opinion that dehorning is of great value to all breeders and fatteners of cattle, and to the dairy farmer; hence, I am glad to take the chance of once more ventilating the matter.

"ORIGIN OF THE POLLED SHORTHORN.

"It was natural that the breeding of hornless cattle from the horned should originate in the United States of America, because in the days when the Longhorn held almost complete possession of the American cattle ranches, and very long journeys by rail had to be undertaken to the meat packers, the damage done by horns was very great. The packers found a much higher percentage of loss in bruised meat on the carcasses of horned cattle, and they make a difference of from five to ten cents per 100 lb. in favour of polled cattle.

"At rare intervals a hornless calf is born in a horned herd, and such have proved to be very prepotent in imparting the hornless feature to their progeny. How these sudden variations come about has never been explained, but it is a fact that a hornless bull will nearly always produce hornless calves. There was, and may still be, a strain of hornless wild white cattle at Somerford Park in Cheshire, whose origin is unknown, but it has been kept pure for at least 250 years. There are other polled breeds in Britain: The polled Angus, the Black Galloway, and the Red Polls of Norfolk and Suffolk.

"The Polled Durhams (Shorthorns) originated in America about the year 1870, and they contained two strains: The Single Standard and the Double Standard. The Single Standard Polled Durhams are high-grade Shorthorns; the Double Standard Polled Durhams are purebred Shorthorns, but the Single Standard has almost gone out of existence. Both strains resemble very closely the purebred Shorthorns.

"The Polled Durham Association was established in 1889, with a membership of eight breeders. As far back as 1908 the membership had been increased to 2,200 breeders of Polled Durhams, and the membership goes on increasing. The breed was developed mainly in the States of Ohio, Indiana, Illinois, Iowa, and Minnesota.

"The history of the Single Standard strain is fully known. About 1870, several breeders, working independently, undertook to produce hornless Shorthorns by putting horned Shorthorn bulls on hornless or 'mulley' cows of unknown breeding. There is said to be no doubt that those cows were descended from polled European stock.

"The produce resulting from this cross were carefully selected, all bulls being sent to market, and the hornless heifers bred to horned Shorthorn bulls, which process was continued for four or five generations. Polled bulls of this high-grade stock were then used on the polled heifers for a generation or two, when Shorthorn bulls were again resorted to. The progress was slow, but the hornless characteristics proved very persistent, and by the year 1899 animals were required to carry 96 per cent. of Shorthorn blood to be eligible for registration.

"Apart from the injury that is often done with horns, hornless cattle thrive better than the horned, because they are more content, having lost the fear of their herd mates. The damage done to the carcasses of fat cattle in transit to the freezing works is well known, and it is not uncommon to see a fine carcass in the freezing works so badly damaged with horns that it is only fit for turning into manure.

"A strain of purebred hornless cattle cannot be developed by constant dehorning, just as a tailless sheep flock cannot be developed by constant docking; but, if a ram lamb were born minus a tail in a purebred tailed flock, the chances are that he would produce tailless lambs, but I have no record of this being tested.

"In 1905 a rule was passed requiring all animals to trace to recorded stock, thus closing the books and preventing the introduction of any more up-graded cattle. This development served to arouse general interest in hornless cattle, and paved the way for the development of the Double Standard strain.

"The rapid increase of the purebred Polled Shorthorns is due to the fact that the breeders had an unlimited field to draw upon for females. Purchases of cows and heifers were made from the very best Shorthorn herds, and breeders have a keen demand for their hornless bulls. There is no doubt that there is a great future before the breed, which is eligible for both the Polled Durham and Shorthorn Herd Book. So far as we in New Zealand are concerned, hornless breeds have become more precious since meat-chilling was perfected.

"THE POLLED HEREFORD.

"This breed originated in America since 1889. As in the case of the Polled Shorthorns, there are two strains: double and single standard. The pure hornless cattle, and are so-called because they are eligible for entry in both the Polled Hereford Herd Book and the American Hereford Herd Book. The Single Standard Polled Herefords are eligible for entry only in the Polled Hereford Herd Book.

"Mr. Guthrie, of Atchison, Kansas, discovered in the autumn of 1889 a polled bull calf with perfect Hereford markings. The dam was three-quarters Hereford and one-quarter Shorthorn in blood. The sire was one of two Hereford bulls which ran with the herd. These were Grateful 3rd and Treasurer. The calf was named Discovery, was a good type, and at three years of age, without special feeding, weighed 1,986 lb. By using this bull on horned Hereford cows, Mr. Guthrie secured a number of polled cattle of true Hereford type. It is stated that all the calves sired by Discovery from horned cows were polled. Some of the best individuals were bred together, and by 1898 a small herd of very high-grade Polled Herefords had been built up. From them work was started, looking to the production of Double Standard Polled Herefords.

"Another line of Single Standard Polled Herefords was established by crossing and up-grading by Mossom Boyd, of Bobcaygeon, Ontario, Canada. In 1893 he bred two purebred Angus bulls to five purebred Hereford cows each. Most of the nine calves resulting were black with white face, and polled. Only one calf was retained for use. This was a bull calf, black, with the white markings of a perfect Hereford type, and polled. Twenty-three calves resulted from the two years' breeding. Nine were black, with white faces, and more or less of other Hereford markings. Fourteen were red, with white face, and more or less of other Hereford markings. Five of the lot were retained—two bulls and three cows. All were red with perfect Hereford markings. One bull and the three cows were purchased by the Embar Ranch in Wyoming, and were used there for some years. The progeny retains the Hereford marking, and many of them are polled. They are simply high-grade hornless Herefords, and not as prepotent as purebreds, but are excellent as individuals.

"The Double Standard Polled Herefords, like the Double Standard Polled Durhams, owe their origin to 'sports.' In 1900, Warren Gammon and Sons, of Des Moines, Iowa, undertook to locate any Polled Herefords that might exist. They wrote to all the American Hereford breeders, and located fourteen animals that were minus horns, due to incomplete transmission of hereditary resemblance. About the same time Mossom Boyd purchased two polled bull sports, purebred and very prepotent dehorners. Development has come by breeding together the polled stock, and by using the polled bulls on Polled Hereford cows.

"The Polled Herefords have made great strides in recent years, and many of them are really very fine beef cattle—a number quite excellent for the chilled meat trade.

"Dehorning of the dairy herd is very easy by operating on the young calves with caustic potash, but on the runs where many beef cattle are bred dehorning them in this manner would be considerable trouble, and the best plan is to turn to the pure breeds that are naturally hornless, or to those that have been built up by judicious selection.

"A hornless breed of Milking Shorthorns could be produced by crossing the cows with a good bull from a milking strain of the Red Polls. This might affect the milk yield for a time, but some of the Red Polls are good milkers."

The Value of Reading—A Working Farmer's Thoughts.

In a paper read at a district farmers' conference, Mr. H. Queale, of the Boor's Plains (Yorke Peninsula) Branch of the South Australian Bureau of Agriculture, had this to say on the value of reading to the man on the land:—

Reading ranks with travel and intercourse with one's fellow men as a means of acquiring knowledge, and for the rank and file of farmers is the most accessible. The average farmer is blessed with a fair amount of commonsense, and has his own ideas about matters pertaining to his daily life. Left unexpressed, they are of small account. But passed on to his fellow men, the ideas become vitalised and of greater importance. Even the wrong idea is best expressed, because one is given the chance to help and correct his fellow man. Of infinitely greater importance is the good idea when it is passed on.

Many men cannot always evolve an expression from a thought. He is not good at telling the other fellow, with any marked degree of lucidity, what he has in mind. This applies in a peculiar manner to the man on the land, because he lives, to a point, unto himself. Resulting from this quasi-lone life is an embarrassment at hearing his own voice, with the consequent difficulty of expression. Herein lies the value of reading. The man who reads and takes notice of what he reads, unconsciously absorbs words, terms, phrases, and paraphrases, and modes of expression. These are stored away in his subconscious mind, and at the most unexpected times, very often, these expressions flash across his mind and help him out of a difficulty. He acquires an ease of manner and a freedom of speech from his reading which, without travel and intercourse, would be denied him. With a little reference to a good dictionary he will also acquire correct pronunciation and enunciation of the language of the day.

In his daily life he has the practical experience of his work, and if he couples this with studying suitable books he is undoubtedly the gainer. The bogey word "theory" would certainly lose a vast amount of valueless meaning to the conservative-thinking farmer, and he may become a Bureau member and a reader of the "Journal of Agriculture," the value of which is very great.

To accumulate knowledge and obtain ideas of current topics the constant use of the daily paper is unsurpassed. Reading widens one's outlook and extends the vision to realms of thought and feeling otherwise unattainable. Australia, by reason of its great distance from other countries, is apt to foster ideas of insularity. Although wireless and aerial progress have minimised distance, the man on the land, by his isolation, still labours under many disadvantages. Travel is too expensive to be indulged in extensively.

The desire for and value of co-operative thought and action have been evidenced times without number. The danger of thinking and acting alone threatens to become political retrogression and industrial stagnation. The value of reading to the man on the land cannot be too greatly stressed. For as he reads so he thinks, and as he thinks so does he act. The value of acting upon the result of co-operative thought brings its own reward.

As a pleasure and a hobby the book lover finds nothing so entrancing or enchanting as a good book. R. L. Stevenson's lines, "What are my books? My friends, my church, my tavern, and my wealth," readily come to one's mind. To-day the value of recreation to the man on the land has a definite place. It is a time of serious thought and grim struggle. Unless he spends his leisure hours—few enough though they be—in pleasant ways, his mind will not be refreshed when he again takes up his daily duties.

The choice of literature is of very great importance. There are many dangers as well as benefits to be had from reading. It is well worth a man's while studying carefully the works of the day before accepting all and sundry alike, and when Australia has a better informed farmer who has the ability to put his "case," then, and then only, will she have a rural population who can defend the man on the land and lend a dignity to his calling.

Reading is one of the surest, safest, and most accessible means of acquiring a sense of expression, a knowledge of matters requiring understanding, and a real and lasting pleasure to the man on the land.

Australia's Great Trees.

In Volume LI., No. 11, the March issue of the "Victorian Naturalist," Mr. A. D. Hardy has written a most informative article on "Australia's Great Trees." He says that so many reported excessive heights of Australian trees half a century ago were found, on official investigation, to be exaggerations; that in recent years, when eucalypts 300 feet in height had become rare, all records of such exceedingly tall trees met with incredulity or were quoted with much caution by responsible writers. On the other hand, reckless or misinformed persons have shown little hesitation in reviving and perpetuating erroneous figures, which then have been repeated in British and foreign publications. In these prints it is not always obvious that what is recently quoted as for living trees is really based on information in old and discarded records of trees that have long since vanished, or that a statement in some recent number of a periodical has been corrected or withdrawn in the following number. Reliable figures can be quoted to-day for the height of existing tall trees. They have been carefully measured by officials, and the results officially recorded. In Victoria the largest trees are found in the Central South divisions of the State, in the Dandenong Ranges, the South Gippsland Ranges, the Great Dividing Range, and the Otway Ranges. In 1896, in the Cumberland Valley, Mr. D. Ingle, then a local forester (later one of the Forest Commissioners of Victoria) directed attention to a tree which measured 301½ feet. A belt of trees in the Cumberland River or Tyers River Valley covering an acre of ground was cleared of undergrowth to admit of the measurement of the tree. The total number of trees was twenty-seven. Height measured with Abney level (or clinometer) average 266 feet; tallest of the group, 293 feet; girth at 10 feet—average, 13.5 feet; largest girth, 17 feet 4 inches. The Monda tree on the southern slope of the Great Dividing Range measures to the forked and broken top 287 feet by Abney level measurement. This big tree must have been over 300 feet. Now it shows signs of decay, and recent storms have reduced its height still further. In the Otway region there is a tall mountain ash forest approximating 300 feet; Forests Commission clinometer measurements making several over 290 feet.

Odd Jobs for the Orchardist.

This period of the year is frequently regarded by many orchardists as being the most convenient in which to undertake the many odd jobs that accumulate during the busier periods. To delay too long in carrying out such needed work as overhaul of fencing and gates, painting and repairs to machinery, &c., results in much quicker depreciation, and finally the much heavier expense of replacement long before it would have otherwise been found necessary.

Protection of the woodwork and iron roofs of buildings by painting, or even by coating the woodwork with preserving oil, is a job that is not always attended to as frequently as it might be. Consideration should also be given to the desirability of painting the wooden portions, and some of the metal parts as well, of farm machinery.

This is also a good time of the year to attend to repairs to ploughs, cultivators, spray pumps, and the rest of the working plant. There is little time to do these jobs while the season's work is in full swing. Furthermore, to have the machinery and plant in the best working order means both greater efficiency and economy of operation.

Similarly, a thorough overhaul of the packing shed and its equipment at the present time is well worth while.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

Rickets in Queensland.

THE other day one of our Baby Clinics was visited by a healthy woman with a healthy breast-fed baby a few months old. There was nothing wrong with either of them; but the mother was anxious, because she had been told by a doctor that her two older children were suffering from rickets. We asked to see these older children. Their father, who was waiting outside, brought in a boy aged four and a little girl not yet two years old. The boy was big for his age and apparently well-nourished, but had had knock-knees. He will probably need two operations and prolonged treatment to straighten his legs. The little girl had bad bow-legs. She may be cured without operation, but will also need prolonged treatment.

Rickets and Diet.

Here was a lamentable fact; two healthy parents with two deformed children, who should have been perfectly straight and healthy. The parents were well-intentioned and affectionate, and the condition of their children was not due to poverty. It was due entirely to want of knowledge. Rickets is an easily preventable disease, and should never occur in Queensland. It is a condition in which the young growing bones are ill-developed. In extreme cases their growing ends are visibly enlarged and their development is slow. In less severe cases the bones grow, but they are soft, the leg bones gradually bend with the child's weight, and the straightening of them is no easy matter. Unfortunately, in Queensland this latter condition is not rare. Rickets occurs only in children whose diet is defective. For the making of bone three things are necessary—lime, phosphate, and vitamin D. Without the vitamin, lime, however abundant in the diet, cannot be absorbed, and is consequently useless. All three are present in cow's milk, and good milk taken in sufficient quantity is an absolute preventative. A partial deficiency in the supply of milk may be compensated by cod liver oil. When healthy breast-fed babies are weaned at nine to twelve months, their diet should consist mainly of cow's milk and they should be given at least one pint daily. Failing this, rickets may be expected. According to Dr. Harvey Sutton no less than 25 per cent., that is one in four, of the children entering school in New South Wales show definite evidence of mild rickets. If the children are poorly nourished and grow slowly, softening of the bones may be slight. If, however, they are healthy in other respects and grow fast, the softening is worse, for the rapidly growing bones of these children need a larger supply of lime, phosphate, and vitamin D. Together with bad bones these children develop faulty teeth.

Rickets is not merely a disease of the bones and teeth. Want of the vitamin causes a defective supply of lime to the whole body, and lime is a necessity to all living tissue. Rickety children suffer from unstable nervous systems, and easily go into convulsions. They are retarded mentally just as much as bodily. Indeed the mental inferiority may be more important than the physical. All deficiency diseases affect the nerve tissues. This is true of scurvy, it is evident in the neuritis of beri-beri, and the dreadful results of pellagra. We need to realise the importance of an adequate vitamin-rich diet for the growth of a healthy, stable, active mind.

Rickets and Sunlight.

We depend mainly on our diet for a sufficient supply of vitamin D, but it may also be obtained from the effects of sunlight on the human skin. The little brown and black babies, who sprawl in the sunshine, never suffer from rickets. In Australia the sun gives us this vitamin for nothing—nothing at all. Unfortunately, our babies and toddlers are kept out of the sun, or so covered with clothing, that the sun's gift is of no use to us. Certainly care is needed in protecting their heads and eyes, and in gradually exposing their skins to the sun's rays, for otherwise they may suffer from sunburn. For this there are rules with which our clinic nurses are familiar.

One fine warm afternoon lately I paid a visit to a lady whose two small children were playing happily on the grass in very scanty bathing suits. Their mother explained that their skins had been gradually hardened to sunlight from babyhood, and they had never had sunburn. How much happier our children might be, if other mothers did the same! Social custom may compel us to over-clothe our children in the streets, but surely in our own gardens and backyards bathing costumes are as healthy for them as on the sea beaches.

IN THE FARM KITCHEN.

Pickles.

On a commercial scale cauliflowers, cucumbers, and onions are held for long periods in brine, and a large proportion of the pickles purchased in the stores are prepared from such brined vegetables. They are put down in large barrels or tanks and covered with a brine containing approximately 1 lb. of salt per gallon of water. The salt draws water and carbohydrates from the tissues of the vegetables and also toughens them somewhat. It also prevents the growth of many kinds of bacteria, but certain types which produce lactic acid can tolerate salt, and these organisms slowly ferment the carbohydrates. This is known as the curing process, and cured vegetables have a darker colour than the fresh ones. Cucumbers change from a bright green to a deep olive green colour, and the flesh becomes more transparent. Cured vegetables are seldom used until they have been brined from six to twelve months. In making pickles in the home this long brining is unnecessary. The vegetables are generally covered with salt or placed in a brine for only one or two days. The salt or brine withdraws some of the water from the vegetables and makes them more crisp.

General Method for Home Pickling.

In pickling, as in any other methods of preservation, it is important that the vegetables should be in a thoroughly fresh condition. After the preliminary preparation, such as removing outer leaves of cabbage or cauliflower and cutting the larger vegetables into suitable pieces, the vegetables should be either placed in a brine made from 1 lb. salt and 1 gallon water or sprinkled liberally with salt and

left from 12 to 48 hours. If the vegetables are placed in brine they should be kept under the liquid as much as possible by weighing them down. If dry salt is used the vegetables should be placed in a large porcelain basin in layers, with a good sprinkling of salt between each layer. The time necessary for soaking in brine is given in the recipes at the end of the chapter. The vegetables should be removed from the brine and rinsed thoroughly in cold water to remove traces of salt. They should then be allowed to drain to remove as much water as possible and packed into clean jars to within 1 inch of the top. If any water has settled at the bottom of the jar during packing it should be drained off before the jars are filled with vinegar. Sufficient cold, spiced vinegar should be poured over the vegetables to cover them completely; in fact, there should be a layer of vinegar on top of the vegetables of at least ½-inch. During storage there is a certain amount of evaporation of the vinegar, and if the vegetables are not well covered with vinegar at the outset the vegetables at the top of the jar are left uncovered after some weeks and become very badly discoloured. When the vinegar has been poured over, the jars should be sealed as tightly as possible. If metal caps are used, care should be taken to see that the vinegar does not come into contact with the metal.

Vinegar.

The best vinegar should be used for pickling, and it should have an acetic acid content of about 5 per cent. White vinegar gives a better appearance to the pickles, but malt vinegar is preferable because it gives the pickles a better flavour. Spices are generally added to the vingar before it is poured over the vegetables. To make spiced vinegar, the following ingredients should be added to each quart of vinegar:—

¼ oz. cinnamon bark
¼ oz. cloves
¼ oz. mace
¼ oz. whole allspice
A few peppercorns or a pinch of cayenne pepper.

The spices tied in a muslin bag should be added to the vinegar and brought just to boiling point. It is important to have the lid on the saucepan during this process, otherwise much of the flavour is lost. The vinegar should then be removed from the stove and allowed to stand for two hours. The spice bag should be removed, and the vinegar is ready for use. There is a certain amount of controversy as to whether the vinegar should be used hot or cold, but experience has shown that cold vinegar gives the better result when pickling vegetables such as cabbage, onion, &c., which should be crisp when ready to eat, while hot vinegar proves better for the softer type of pickles such as walnuts, plums, &c.

RECIPES.

Pickled Cauliflower.

Sound cauliflower should be selected and the outer leaves removed. The flowers should be broken into small pieces, washed thoroughly in salt and water, placed in a large basin, and covered with brine made from 1 lb. salt to 1 gallon of water, and allowed to stand for 24 hours. They should then be rinsed in cold water, drained thoroughly, and placed in bottles or jars. The spiced vinegar should be poured over, and the bottles sealed with corks or tied down with a piece of bladder.

Pickled Onions.

Small, even-sized onions should be selected and placed with their skins on in a brine made from 1 lb. salt to 1 gallon water. They should be left for 12 hours, and then peeled, laid in a fresh brine, and left for 24 or 36 hours. They should then be removed from the brine, washed thoroughly in cold water, and allowed to drain thoroughly. The onions should then be filled into jars or bottles, covered with cold spiced vinegar, and kept for three or four months before being used.

Pickled Red Cabbage.

The cabbages should be firm and of a good colour. They should be washed and any discoloured outer leaves removed, and the cabbage cut into shreds. The shreds should be placed in a large basin, each layer being sprinkled with salt, left for 24 hours, the shreds allowed to drain thoroughly, and then packed into jars or bottles and covered with cold spiced vinegar.

Pickled Beetroot.

The beets should be washed, care being taken not to break the skin. They should be placed in boiling salted water, and simmered gently for 1½ hours. When cold, they should be peeled and sliced into rounds ¼-inch thick, packed into bottles, and covered with cold spiced vinegar. They should not be used for at least a week.

Pickled Gherkins.

The gherkins should be placed in a brine made from 1 lb. salt to 1 gallon of water, left for three days, drained well, and packed into jars. Hot spiced vinegar should then be poured over them, and they should be covered tightly and left for 24 hours in a warm place. The vinegar should be drained off, boiled up, and poured over the gherkins, which should be covered tightly, and left for another 24 hours, this process being repeated until the gherkins are a good green. After the final process, a little more vinegar should be added if necessary, and the jars corked and stored.

Pickled Vegetable Marrow.

2 lb. marrow (after peeling)
4 oz. sugar
¼ oz. ground ginger
¼ oz. mustard
¼ oz. curry powder
6 peppercorns
3 gills vinegar.

The marrow should be cut up, sprinkled with salt, and allowed to stand overnight. The other ingredients should be added to the vinegar, boiled for five minutes, and then the marrow added and cooked until tender. The pickle should be packed into jars and sealed.

Pickled Green Tomatoes.

5 lb. green tomatoes
1 lb. small onions
1 lb. Demerara sugar
1 quart spiced vinegar.

The tomatoes and onions should be sliced, sprinkled with salt, left overnight, and drained thoroughly. The sugar and vinegar should be boiled, the tomatoes and onions added and cooked until tender. They should then be put into jars and sealed

Mixed Pickle.

Cauliflowers, onions, cucumbers, and French beans may be put up as a mixed pickle If small cucumbers can be obtained they are preferable. The vegetables should be cut into suitable sized pieces, salt sprinkled over them, and allowed to stand for 48 hours. They should then be washed, drained thoroughly, packed into bottles, the vegetables being arranged neatly, covered with spiced vinegar, and sealed.

Pickled Damsons or Pears.

7 lb fruit
4 lb. sugar
3 pints vinegar
½ oz. whole cloves
½ oz. allspice
1 piece ginger root
1 stick cinnamon
The rind of half a lemon.

Damsons should be washed and stalked; pears should be peeled, cored, and cut into eighths or quarters according to the size of the pears. The sugar should be dissolved in the vinegar, the spices crushed, tied loosely in a muslin bag and added to the vinegar. The fruit should be simmered in the spiced, sweetened vinegar until quite tender. Then the liquid should be drained from the fruit, which should be packed neatly into jars. The vinegar should be boiled gently until slightly thick, and each jar filled with enough hot vinegar syrup to cover the fruit. The pickle should be tied down with bladder, or corked securely. It is better if it is kept some months before being used.

IN THE FARM GARDEN.

Green Manure in the Vegetable Garden.

Where it is intended to commence the cultivation of vegetables during the spring this is the most important time of the year to make the preliminary preparations. As advised in earlier issues the laying out of the ground, digging and trenching are important operations which may be undertaken now. Green manuring is a most important and useful practice for bringing soil into good condition for sowing and planting in the spring, when almost any variety of vegetable may be grown. Green manuring offers a ready means of increasing the organic matter in the soil, and also of adding to the soil fertility. It is also the most useful means of suppressing weed growth and cleaning land for future cropping. It is generally recognised that legume-bearing plants are the most useful for green manuring. Field peas are very largely used. When plants belonging to the legume bearing family are grown under suitable conditions, and the roots are attacked by bacteria in the soil which produce nodules upon the roots of the peas, the plants are capable of absorbing a considerable amount of nitrogen from the air, and thus the soil is enriched by this valuable plant food which is expensive to purchase in manures. But unless the nodule forming bacteria are present in the soil the legume-bearing plants will draw from the soil the nitrogen they require for their growth, and the soil will be no richer in this element for their use.

If the land has not grown peas successfully before, it will pay to take a bushel or two of soil from a garden patch or field where peas have thrived, and sprinkle a small quantity of this soil along the drills where the peas are being sown. Another very useful legume for green manuring is the tick or horse bean. This plant resembles the broad bean, but the seeds are much smaller and are not used as a vegetable. The main object of a green manure crop is to obtain as much organic matter as possible for digging into the soil in the early spring. In this regard the horse bean is more valuable than the field pea. If it is necessary to inoculate land with nodule-forming bacteria for this crop, soil should be taken from a garden patch where broad beans have been grown successfully. There are different species of organism which produce nodules upon the roots of legume plants, and the bacteria which produce the nodules on the roots of peas will not similarly act upon the roots of beans. For general purposes a crop of Algerian oats or Cape barley is very satisfactory as a green manure crop. These cereals may be depended upon to give a good strong growth, providing ample bulk for digging into the soil. They also have the advantage that, not being related to any of the plants commonly grown in the garden, they are not subject to diseases which may be transferred to the vegetable crops to be grown later on. When sowing green-manure crops superphosphate should be used with the crop at the rate of 1½ to 2 oz. to the square yard. The use of the fertilizers will produce a greater bulk of green manure, and where the crop is dug into the ground the phosphates which have been absorbed by the crop will be liberated in the soil as the plants decay, and be made available in time for other plants to use.—"The Australasian."

Nitrogen for the Garden.

The most important and at the same time the most expensive element of plant food in garden soils is nitrogen. It is obtained in various forms, and the pea and clover family have the power of absorbing and assimilating to their own use the nitrogen of the atmosphere. It is for this reason that nitrogenous manures should not be applied, except in extreme cases, to beans or culinary or sweet peas. The four principal nitrogenous manures are sulphate of ammonia, nitrate of soda, nitrate of lime, and calcium cyanide of nitrolim. All are highly concentrated, and need to be used with the utmost care.

Nitrogen always stimulates the development of stem and foliage at the expense of flower and fruit or seed. If after excessive wet, or from some other cause, a plant appears to stand still, a small dose of nitrogenous manure will often stimulate it, and have a wonderful effect. On the other hand, a dose of a nitrogenous manure given when the plants are in flower or seed will often cause them to shed their flowers and fruit or seeds by causing an exuberance of growth of a soft, sappy nature.—"New Zealand Farmer."

Kitchen Garden.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A Reminder to Onion Growers.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

The Farm Vegetable Garden.

The question of drainage should be considered in relation to all classes of soil, but especially in relation to those that are at all heavy. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months. Now is the time to think of the question of treatment.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil, and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess quantities of water to be carried away with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best to laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brush-wood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

"The Dairy Produce Acts, 1920 to 1934."

An examination for Certificates of Proficiency in the subjects of Milk and Cream Testing, Milk Grading, Cream Grading, Butter Making, and Cheese Making will be held on Saturday, 27th July, 1935, in centres that will, as far as possible, be arranged to suit candidates, who should notify the undersigned not later than the 12th July.

Entrance fee (5s. for each subject) should accompany the application, with an additional 10s. 6d. if a special centre is desired.

Candidates must not be less than eighteen years of age on the day of examination.

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock, Brisbane.

The depth at which the drain should lie will depend upon the class of soil, but, needless to say, it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 ft. 6 in. to 3 ft. is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on land of a heavier character should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.—A. and P. Notes, N.S.W. Department of Agriculture.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Orchard Notes for June.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured

fruit, owing to the absence of fruit-fly punctures, as there is always a percentage of damaged fruit which is liable to blue mould infection, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit-fly, and are a menace to the district. Now is the time to get rid of them. If such

trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be prunded now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyards ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whreas if cut and ased now they will keep in good order so that they can be used during the hot weather.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

In Memoriam.

F. F. COLEMAN.

We regret to record the passing at the age of sixty-six years of Mr. F. F. Coleman, Officer in Charge of the Pure Seeds, Stock Foods, Fertilizers, Pest Destroyers, and Veterinary Medicines Branch of the Department of Agriculture and Stock, which occurred on 24th April.

The late Mr. Coleman was born in Sandwich, England, and received his early education in England and France. Later, he specialised in the study of seeds and plant life and took out an extension course under the auspices of the Cambridge University. In 1903 he obtained an award of merit from the Royal Horticultural Society, London. He was afterwards engaged in the supervision of extensive variety trials, and the inspection and selection of crops for seed purposes in both England and France. Interested in military matters, he joined the British Volunteer Garrison Artillery. After coming to Australia he entered the Queensland Department of Agriculture and Stock in December, 1914, in the capacity of seed expert, and organised the Queensland seed testing station. To the work of the station, other activities were added from time to time. He made grasses his hobby, and pasture improvement was added to the more important activities of his branch. He planned a comprehensive series of experiments, which he developed indefatigably. He was the first secretary of the Pasture Improvement Committee, through which experiments on a larger scale was possible. He was a capable administrator, maintaining a high standard of efficiency in his branch. In legislation governing pure seeds, fertilizers, stock foods, and pest destroyers, Queensland is regarded as a pioneer, and in his administration of the several Acts of Parliament respecting those agricultural essentials, and veterinary medicines also, Mr. Coleman did good work for the man on the land, whose interests within the scope of the activities of his branch he was assiduous in protecting. In some of those measures he had a shaping hand, assisting in the drafting of them with an eye to their effective application when passed into law. Method, thoroughness, and dependability characterised all his work, never losing sight of the practical end in view.

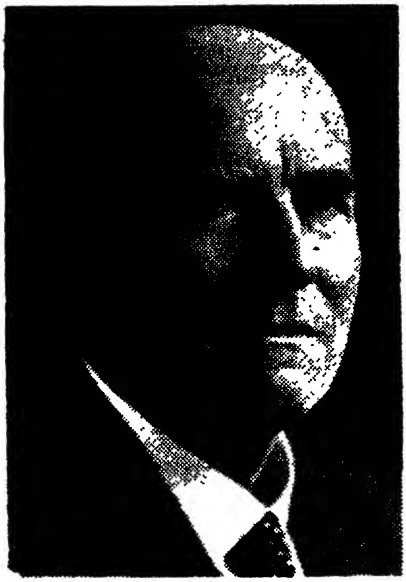
He was a frequent contributor to the "Queensland Agricultural Journal" on technical subjects, and among his recent contributions were "Pasture Improvement," "Intensive Pasture Improvement," "Subdivision, Renovation, and Top Dressing to Produce Better Grass," "The Cultivation of Grasses," "Some Factors that Determine the Keeping Qualities of Stored Maize," and "Wild White Clover," and "Comparative Analyses of Grasses, Clovers, and Other Fodder Crops."

The late Mr. Coleman's first wife died in 1932. Later he married Miss L. Brundritt, who survives him; also two sons, Messrs. Bert and Leslie Coleman. His second son, Lieut. E. L. Coleman, was killed in action in France while serving with the Australian Field Artillery (A.I.F.). The interment took place at the Lutwyche Cemetery in the presence of many of his former colleagues and representatives of the commercial life of the city. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) was represented by the Under Secretary and Director of Marketing (Mr. E. Graham). To the late Mr. Coleman's sorrowing relatives our deep sympathy is extended.

In Memoriam.

J. F. McCAFFREY.

After a short illness, the Registrar of the University (Mr. J. F. McCaffrey), passed away on 4th April, at the Mater Misericordiae Private Hospital. His death came as a shock to all sections of the University, as well as to the general community, where he was loved as a man, and esteemed as an administrator.



The late Mr. McCaffrey would have attained his fifty-third birthday on 25th November this year. He was born at St. Lucia and received his primary education at what is now known as the Ironside State School, winning an open schoolarship under the head teachership of Mr. J. Loney, to the Christian Brothers' College, Gregory terrace. It is a significant fact that his nom-de-plume in one section of the scholarship examination was "Industry," a word which has virtually been his motto through life, and which is in some measure responsible for his comparatively early demise.

Having won his scholarship, he passed the New South Wales junior public examination, and the qualifying examination, entitling him to entry into the Queensland Public Service, in 1898. He was given some banking experience in the State Savings Bank before being transferred to the Harbours and Rivers Department. In 1904, he was transferred to the Department of Public Instruction. It was here that the young man began to show the sterling qualities as an administrator and organiser.

His industry and his organising ability soon brought him under the notice of Mr. J. D. Story, I.S.O., who was then Under Secretary, and Mr. McCaffrey was seconded for duty to the University of Queensland on its foundation in 1910 as chief clerk and accountant. Mr. Story had been very much involved in the early work of the University organisation, and he chose Mr. McCaffrey for his industry and his administrative ability to fulfil this important post in the early history of the institution. His services were first made available to the Senate in April, 1910, and soon afterwards he resigned his position with the Queensland Public Service, and in October, 1910, assumed to full responsibility of his new post at the University.

As chief clerk his advice was invaluable. He was secretary also to the Administrative and Finance Committees of the University. When in 1925 Dr. F. W. S. Cumbrae Stewart was appointed to the Garrick Professorship of Law Mr. McCaffrey was his logical successor to the post of Registrar.

How well he has filled this post during the past ten years no one but those most closely associated with him fully realise. He was an ideal Registrar, combining a rare business acumen with a most kindly heart. He met the students on the friendliest possible footing. Indeed, many a graduate to-day can thank the tolerance and help of Mr. McCaffrey which made it possible for him to finish his degree course. He was the

perfect link between the undergraduate body, the Senate, and the University staff, all of whom loved him as a man and respected him as an administrator. His loss to the University is beyond compute, not only for his personal qualities but also because of the manner in which he had centralised every administrative aspect of University activity. He worked like a slave in the service of the University, never sparing himself. It is a tragic coincidence that he passes on the eve of the University's celebration of its twenty-fifth birthday. Actually in January Mr. McCaffrey completed twenty-five years of service with the University. Keenly interested in land industries, the late Mr. McCaffrey assisted in the organisation of the Council of Agriculture, for which for a term he acted as secretary. The Faculty of Agriculture also claimed his close interest, and rural economics had in him an earnest student. He assisted in founding the St. Lucia Farm Boys' School, which is situated on University property.

He leaves a widow and one son and one daughter to whom deep sympathy is extended.

When the Chancellor (Sir James Blair) heard the sad news he was deeply affected. He said that Mr. McCaffrey had been a highly efficient and painstaking officer who had displayed great capacity for work and much enthusiasm in his efforts on behalf of education and the University. He was ever ready to offer sympathetic and sound advice to the students, by whom he was greatly beloved. Mr. McCaffrey was tactful and courteous in his dealings with people, and was trusted and respected by the members of the Senate and the staff. He would be remembered kindly and gratefully by all those with whom he came in contact—privately or officially.

On behalf of the Senate and himself, said the Chancellor, he would like to extend to Mrs. McCaffrey, her son and daughter, and relatives, an expression of deepest sympathy.

WALTER HIGHET.

Mr. Walter Highet, one of the senior slaughtering inspectors of the Department of Agriculture and Stock, died with tragic suddenness while on duty at the Cannon Hill Saleyards on Thursday, 4th April. For two days previously, Mr. Highet had been slightly ill, but did not worry much about it. At the saleyards he complained that he was not feeling well, and returned from the yards to his office. There while making out a stock permit he collapsed and died soon after the arrival of a doctor who had been summoned immediately.

Mr. Highet, who was known widely and esteemed highly in stock circles, was born in Garlieston, Scotland, sixty-three years ago, and came to Queensland at the age of twenty. He went to Western Queensland for colonial experience, and was engaged in the pastoral industry, with cattle mainly, for a considerable time. This experience, added to veterinary knowledge gained in Scotland, qualified him for appointment to the Department of Agriculture and Stock. He was appointed subsequently a slaughtering inspector, a position which he had held for nearly forty years. On Friday, 5th April, he was laid to rest at the Lutwyche Cemetery in the presence of a large assembly representative of the stock industry and the business life of the city, and which included many old departmental colleagues. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) was represented by the Under Secretary and Director of Marketing (Mr. E. Graham).

The late Mr. Highet is survived by his widow and two sons (Messrs. J. S. and R. Highet), two daughters (Mrs. W. A. Lovegrove and Miss B. Highet), and two grandsons, all of Brisbane; and to them the deepest sympathy is extended.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	March.	No. of Years' Records.	March. 1935.	March. 1934.
North Coast.	In.		In.	In.
Atherton	8·48	34	16·56	14·36
Cairns	17·89	58	34·36	19·11
Cardwell	15·51	63	16·97	8·87
Cooktown	14·94	59	34·57	9·81
Herberton	7·62	49	11·24	12·80
Ingham	15·34	43	17·79	8·49
Innisfail	25·99	54	46·46	32·38
Mossman Mill	17·07	21	28·74	27·16
Townsville	7·19	64	2·78	0·85
Central Coast.				
Ayr	6·36	48	3·10	0·22
Bowen	5·49	64	2·62	1·62
Charters Towers	3·68	53	1·35	0·59
Mackay	11·73	64	5·20	6·47
Proserpine	11·71	32	2·60	10·33
St. Lawrence	5·15	64	2·62	0·46
South Coast.				
Biggenden	3·69	36	1·66	0·95
Bundaberg	4·97	52	1·11	1·85
Brisbane	5·59	84	1·06	0·82
Caboolture	7·48	48	2·21	4·30
Childers	4·36	40	1·14	1·35
Crohamhurst	11·05	41	4·42	4·79
Esk	4·64	48	1·88	0·78
Gayndah	2·99	64	1·41	0·65
Gympie	6·05	65	2·57	2·38
Kilkivan	3·79	56	0·60	0·41
Maryborough	5·83	64	1·52	2·53
Nambour	8·97	39	4·65	3·97
Nanango	3·33	53	..	0·54
Rockhampton	4·34	64	1·49	0·23
Woodford	7·71	48	1·96	3·40

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	March.	No. of Years' Records.	March. 1935.	March. 1934.
Central Highlands.	In.		In.	In.
Clermont	3·00	64	1·15	0·03
Gindie	2·55	35	0·05	0·07
Springsure	2·87	66	0·48	..
Darling Downs.				
Dalby	2·63	65	0·16	0·01
Emu Vale	2·28	39	0·55	..
Hermitage	2·10	28	0·40	..
Jimbour	2·47	47	0·62	..
Miles	2·60	50	0·46	0·05
Stanthorpe	2·59	62	0·19	1·03
Toowoomba	3·67	63	0·80	0·23
Warwick	2·45	70	0·49	..
Maranoa.				
Roma	2·53	61	..	0·23
State Farms, &c.				
Bungeworgorai	1·51	20	..	0·40
Gatton College	3·08	35	4.09	0·32
Kairi	7·43	20	..	16·90
Mackay Sugar Experiment Station	10·57	37	3·78	5·30

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·79	85	71	91	16	68	24, 25, 26	3457	16
Herberton	..	80	63	90	15	55	24, 25	1124	12
Rockhampton	29·94	88	68	101	15	59	17	149	10
Brisbane	30·02	82	65	91	23	55	17	106	10
Darling Downs.									
Dalby	29.98	86	58	98	15	46	18	16	1
Stanthorpe	..	79	52	90	22	34	18	19	7
Toowoomba	..	79	59	90	23	48	17, 18	80	4
Mid-Interior.									
Georgetown	29·81	92	71	97	11, 13, 15, 28	65	9, 10, 30	475	9
Longreach	29·88	97	69	108	14	56	17	17	1
Mitchell	29·96	90	62	102	14	48	17, 18	13	1
Western.									
Burketown	29·80	92	76	100	26	72	30	333	9
Boulia	29·81	98	72	109	14	60	17, 18	..	..
Thargomindah	29·93	92	64	106	14, 21	54	16, 18	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May. 1935.		June. 1935.		MOONRISE. May., 1935.	MOONRISE. June. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·18	5·20	6·37	5·1	4·11	6·16
2	6·18	5·19	6·37	5·1	5·17	7·15
3	6·19	5·18	6·38	5·1	6·22	8 10
4	6·20	5·17	6·38	5·1	7·27	8·59
5	6·20	5·17	6 39	5·1	8·29	9·40
6	6·21	5·16	6·39	5·1	9·27	10·16
7	6·21	5·15	6·39	5·1	10·19	10·49
8	6·22	5·14	6·40	5·2	11·5	11·16
9	6·23	5·14	6·40	5·2	11·45	11·48
					p.m.	p.m.
10	6·23	5·13	6·40	5·2	12·20	12·17
11	6·24	5·12	6·41	5·2	12·51	12·47
12	6·24	5·11	6·41	5·2	1·19	1·19
13	6·25	5·11	6·41	5·2	1·48	1·54
14	6·26	5·10	6·42	5·2	2·17	2·34
15	6·26	5·10	6·42	5 1	2·9	3·28
16	6·27	5·9	6·42	5·1	3·22	4·18
17	6·27	5·9	6·43	5·1	3·59	5·20
18	6·28	5·8	6·43	5·1	4·43	6·26
19	6·29	5·8	6·43	5·1	5·37	7·35
20	6·29	5 7	6·44	5·1	6·33	8·44
21	6·30	5·7	6·44	5·1	7·35	9·48
22	6·30	5·6	6·44	5·2	8·38	10·52
23	6·31	5·6	6·44	5·2	9·45	11·55
24	6·32	5·5	6·44	5·2	10·51	a.m.
25	6·33	5·5	6·45	5·2	11·55	12·56
26	6·33	5·4	6·45	5·3	a.m.	2·0
27	6·34	5·4	6·45	5·3	12·58	3·4
28	6·34	5·3	6·45	5·3	2·0	4·6
29	6·35	5 3	6·45	5·4	3·2	5·5
30	6·35	5·2	6·45	5·4	4.7	6·1
31	6·36	5 2			5·14	

Phases of the Moon, Occultations, &c.

3 May	●	New Moon	7 36 a.m.
10 „	☾	First Quarter	9 54 p.m.
18 „	○	Full Moon	7 57 p.m.
25 „	☽	Last Quarter	7 44 p.m.

Apogee, 12th May, at 12.18 a.m.
Perigee, 26th May, at 2.30 a.m.

Mars, which on 2nd February, was 5 degrees north of Spica, and on 4th March had advanced to a little north-east of it, apparently turned backwards till on 18th May it will have receded 18 degrees. It will then apparently change its course, and resume a normal eastward direction. A loop will thus be formed in the constellation Virgo, and Mars will be found a useful beacon to point out that constellation. Spica represents the left hand of the Virgin, which is holding an ear of corn; it is also remarkable as one of the two stars of the first magnitude on the elliptic; this year the Sun will pass 2 degrees north of it on 16th October. Spica will reach the Meridian about half-past nine p. m. on 18th May.

The nearness of the full Moon to Antares, the principal star of the Scorpion, will be noticeable early in the evening of the 19th, but an occultation of the star will occur only in the northern hemisphere. The Moon will rise at Warwick at 5.37 p.m.

Mercury, on the 26th, though not nearly at its greatest brilliancy, will be fairly discernable, being nearly 23 degrees above the horizon when the Sun sets. It will be apparently amongst the small stars where Taurus and Gemini meet.

Mercury, quite invisible, will set 13 minutes after the Sun on the 1st; on the 15th it sets at 6.14 p.m., 1 hour 4 minutes after the Sun.

Venus sets at 7.33 p.m., 2 hours 31 minutes after the Sun, on the 1st; on the 15th it sets at 7.48 p.m., 2 hours 38 minutes after the Sun.

Mars rises at 3.50 p.m. and sets at 3.54 a.m. on the 1st; on the 15th it rises at 2.46 p.m., and sets at 2.52 a.m.

Jupiter rises at 5.53 p.m. and sets at 7.9 a.m. on the 1st; on the 15th it rises at 4.53 p.m., and sets at 6.3 a.m.

Saturn rises at 1.39 a.m. and sets at 2.23 p.m. on the 1st; on the 15th it rises at 12.49 a.m., and sets at 1.31 p.m.

The Cross will be upright at its highest position, XII., on the southern Meridian at 10 p.m. on the 1st, and 9 p.m. on the 16th, to an observer at Brisbane, where the Cross will be 57½ degrees above the horizon; at Townsville the elevation will be 49 degrees, and the time 24 minutes later.

1 June	●	New Moon	5 52 p.m.
9 „	☾	First Quarter	3 49 p.m.
17 „	○	Full Moon	6 20 a.m.
24 „	☽	Last Quarter	12 21 a.m.

Apogee, 8th June, at 7.12 p.m.
Perigee, 21st June, at 6.6 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling. Members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The King's Jubilee.

THE most noteworthy event of the month was the Commemoration of the King's Jubilee throughout the British Dominions. Describing the King as the father of his people, the Archbishop of Canterbury expressed the sentiments of the whole Empire when, at the historic gathering in St. Paul's Cathedral on 6th of May, he said:—

> The Empire has become a fellowship of self-governing peoples; yet their freedom has not lessened, but strengthened, their loyalty to the one Commonwealth. It is in one Throne that they find the symbol and bond of their unity.
>
> It may be that by mere force of cirucumstances or sentiment the Throne itself would have been accepted by the people of this realm, and the nations of the Empire, as the centre of their unity. What is certain is that the personality of the King has given to the Throne the power of personal attachment. He brought the Throne into the hearts of his subjects. They have discovered in the Sovereign a man whom they could understand, respect, and trust. They have seen in him a quiet dignity worthy of his high office, and with it an unaffected friendliness. They have seen his constant care for their welfare, and his unselfish devotion in their service.

The King's Message.

Responding to the messages of congratulations conveyed to him by radio by the representatives of the British Dominions and the Crown Colonies, His Majesty the King broadcast the following message to the Empire:—

> At the close of this memorable day I must speak to my people everywhere. Yet, how can I express what is in my heart? As I passed this morning through such multitudes to St. Paul's Cathedral, and as I thought of all that these twenty-five years have brought to me and my country and my Empire, how could I fail to be most deeply moved? Words cannot express my thoughts and feelings, I can only say to you: My very dear people, the Queen and I thank you from the depths of our hearts for all the loyalty—and may I say, love—with which this day and always you have surrounded us. I dedicate myself to your service for the years which may still come to me.
>
> I look back over the past with thankfulness to God. My people and I have come through great trials and difficulties together. They are not over. In the midst of this day's rejoicings I grieve to think that there are numbers of our people who are still without work. We owe to them, and not least to those who are suffering from any form of disablement, all the sympathy and help that we can give. I hope that during this Jubilee all who can will do their utmost to find them work and bring them hope.
>
> It is to the young that our future belongs. I trust that through the fund inaugurated by my dear son, the Prince of Wales, to commemorate this year many of them throughout this country may be helped in body, mind, and character to become useful citizens.
>
> To the children I would like to send a special message. Let me say this to each of them whom my words may reach:—
>
> The King is speaking to you. I ask you to remember that in the days to come you will be citizens of a great Empire. As you grow always keep this thought before you, and, when the time comes, be ready and proud to give your country all your services.
>
> I have been greatly moved by all the greetings which have come to me to-day from all my Dominions and Colonies, from India and from this, my home country. My heart goes out to all who may be listening to me now, wherever you may be—here at home, in town or village, or in some far off corner of the Empire, or it may be on the high seas.
>
> Other anxieties may be in store, but I am persuaded that with God's help they may all be overcome if we meet them with confidence, courage, and unity. So I look forward to the future with faith and hope.
>
> Let me end my words to you with those which Queen Victoria used after her Diamond Jubilee thirty-eight years ago. No words could more truly or simply express my deep feelings now: "From my heart I thank my beloved people. May God bless them."

The Farmers' S.O.S. Save Our Soil.

EROSION takes twenty times as much plant food from the soil as the hungriest crop. Between 1923 and 1933, 30,000,000 acres of agricultural land were destroyed by soil erosion, and ultimately abandoned in the United States. Within forty years, 90 per cent. of cultivable soil has been washed away in parts of British East Africa. In one region—Ukamba—the country is now a land of stark ridges of bare rock. The increasing native population obtains sustenance with the greatest difficulty. In drought years the natives have to be fed by the Government to keep them from starvation.

In 1920 the Union Government of South Africa appointed a Commission to inquire into the best means of avoiding drought losses, largely on the assumption that South Africa was gradually undergoing general dessication. After careful inquiry the Commission concluded that there was little evidence of change of climate, but that since the beginning of European settlement enormous tracts of country had been more or less denuded of the original vegetation, with the result that rivers and waterholes recorded by old travellers had dried up, disappeared, or only occasionally carried water. The consequent prospect was stated in this very alarming way:—"The simple unadorned truth," says the Commission's report, "is sufficiently terrifying without the assistance of rhetoric. The logical outcome of it all is the Great South African Desert, uninhabitable by man." The report goes on to say: "The quantity of rainfall shows little variation; its utility has certainly diminished, for the quantity absorbed by the soil is continuously decreasing, and for this man is responsible."

These impressive phenomena are, of course, not confined to America or Africa, and are common to every continent. Even Europe has its striking examples of the destruction of fertile territory, so essential to the maintenance of man.

The classic example of the Nile, with the joyful "Gyppo" reclining like the little lady in "Floradora" in the shade of the sheltering palm, watching the noble river working for him may, of course, be quoted; but there is, in fact, no comparison of the leisurely Nile with swifter flowing streams. The Nile's annual rise is extraordinarily gradual, and, to a great extent, the inundation of Lower Egypt is now well under control. There is no rush of silt or *débris* over the farming lands.

The causes of erosion are various, but the primary and most important cause is the wide-spread destruction of forests and other soil-binding or soil-retaining vegetation. In Queensland, every farmer on our coastal river catchment areas, as well as every producer in our back country, can see in his own neighbourhood what damage to both agricultural and grazing country unchecked soil erosion can do—damage hitherto quite unnoticed until, in many cases, the land has been robbed of its natural fertility by sheet erosion, or so gullied as to be useless, not only for cultivation but for grazing also. It is no exaggeration to say that in Australia almost every acre of sloping farming land, and much that is out of cultivation, in the higher rainfall zones is being affected by soil erosion.

In Australia generally, through the action of wind and water, depreciation and destruction of land has become definitely a serious national problem demanding immediate attention. Only in recent years has any notice been taken of it, and only then by those to whom the obvious facts have become apparent. So serious is the problem, and so disastrous are its effects, that the cry "Save our Soil" may well be regarded as agriculture's imperative "S.O.S."

The Control of Rats and Mice.

By ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Chief Entomologist.

THE ravages of rats and mice in foodstuffs and their breeding and feeding habits are sufficiently well known to warrant dispensing with a discussion of these aspects of the rodent problem. Consideration of the pests may therefore be confined to the presentation of the main facts relative to their control. It is understood that these notes deal specially with the control of rats and mice in, or in the vicinity of, farm and other buildings.

Exclusion.

Firstly, emphasis must be laid on the desirability of rat-proofing certain classes of buildings by ensuring the elimination of all points at which the rats and mice can gain access. This involves a thorough examination of the buildings to locate such openings and their elimination by concrete, sheeting, wire gauze, or other suitable material. Such measures involving the rat-proofing of buildings are economically practicable in the case of large city produce and food warehouses and country storage depôts, and the saving resulting from the elimination or reduction of losses arising therein from attack by rats and mice justifies the expenditure involved. The rat-proofing of farm buildings is, however, quite a different proposition and cannot generally be accomplished at a cost that would be justifiable: hence, consideration in such cases must be given to the destruction of rats and mice by trapping, poisoning, or fumigation.

Trapping.

Trapping of both rats and mice is of considerable value in rodent control, experience indicating that the simple wooden spring trap produces just as satisfactory or even better results than much more elaborate and correspondingly costly devices. Mice are readily caught if the traps are placed close to the spots frequented by them. The bait may consist of bread, apples, raisins, cheese, or almost any other foodstuff. Rats are not so easily trapped, and success may not be achieved against them unless the traps are left unset, but baited, each day for a few days. They may then be once more rebaited, but this time they should be set, and, the rats' suspicions having thus been allayed, success may be achieved. Baits should, of course, be renewed each day, and in doing so and in handling rat traps generally the wearing of cotton gloves has been recommended.

Poisoning.

Should trapping fail to exercise a reasonable degree of control of the infestation, poisoning will have to be resorted to in order to clean up the rodent population. Experience indicates that the most satisfactory poisons to employ for the control of rats and mice are red squill and barium carbonate The former is now much in favour, largely because it is the safest effective material to employ for such poisoning campaigns. The latter is also a favourite, chiefly because it is a somewhat inexpensive material, it is comparatively safe so far as human beings are concerned, and it is effective. It should, however, be handled with discretion, and precautions must be taken to ensure that it does not contaminate human or domestic animals' food.

Red squill will produce good results in a campaign for the elimination of rats and mice, but its successful use is dependent on attention

to certain details in the preparation and application of the baiting material. The first detail to which attention must be given is the provision of an adequate supply of bait to the rats and mice so that they may, if practicable, be eliminated by a single application of the material. The next point is that several types of bait should be laid in order to cater for the varying tastes of individual rats. A further important point is that as far as practicable no food other than the bait should be available to the rats and mice on the evening on which the bait is laid. Furthermore, the bait should be freshly prepared and applied in the late afternoon in small quantities about the size of a marble, particular attention being paid to the places where the rats and mice usually feed. Uneaten bait should be collected and destroyed.

Should some rats or mice survive the procedure just outlined, it will be necessary to repeat the treatment about three weeks later if a complete clean-up is desired. Baiting material is prepared according to the usual formulæ, except that the red squill is omitted. The bait is laid several times at two-day intervals, uneaten bait being collected and destroyed each morning. This procedure allays the suspicions of the rats and mice, and when these have been overcome red squill is once more included in the baiting mixture. It is well to emphasise the fact that although red squill is the safest poison to use for the control of rats and mice, it should not be handled carelessly. Most other animals, however, will either refuse to eat material containing red squill, or if they do they will soon vomit the bait.

Barium carbonate bait may also be employed in farm buildings with successful results. It is, however, poisonous to human beings and also to domestic animals, and in general preference should be given to red squill bait.

Fumigation.

Fumigation is frequently employed for the control of rats and mice, but it cannot be recommended for rodent destruction on the farm.

Bait Formulæ.

Red squill can be obtained either as a powder or as a liquid, such substances as fish, steak, bran, and oatmeal being employed in the preparation of the bait. A commonly employed bait is obtained by mixing 1 oz. of powdered red squill with sufficient water to produce a thin paste, which is added to, and well mixed with, 1 lb. of fresh, finely chopped-up meat. Another formula is one part of dry powdered red squill to ten parts by weight of oatmeal, minced meat, or minced fish, the ingredients being thoroughly mixed before distribution as bait. A third form of bait is obtained by cutting ½ lb. of bread into ½-in. cubes and mixing it with a pint of liquid red squill.

Barium carbonate is generally used in the form of a biscuit prepared by mixing one part by weight of barium carbonate with three parts of flour. These ingredients are mixed together, sufficient water being added to enable a stiff dough to be prepared. This dough is then rolled out to a thickness of ¼ in. and is cut up into pieces ½ in. in diameter. Finally, these small biscuits are dried in the sun or in an oven and are then ready for use.

The Pinhole Borer of North Queensland Cabinet Woods.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

Continued from page 451, May Journal.

LIFE HISTORY.

DURING the summer months, and frequently at intervals in the winter if weather conditions are mild, adults of *C. grevilleæ* are abundantly distributed through the rain-forest; hence, when a tree is felled during the flight-active period of the day, numerous adults alight on the log or tree, doubtless attracted by the chemotropic stimulus liberated from cut or injured wood surfaces. At first males dominate the infestation and commence to initiate burrows on exposed wood surfaces; thus, presuming that the logs have been cut and lie in the original position of the bole, infestation may take place at the sawn ends, at the sides where bark has been stripped off or otherwise injured, and at the fork of the tree if fractures have exposed wood tissue. The bark is not normally penetrated. Most of the burrows on an exposed wood surface are excavated immediately, though minor supplementary infestation may occur for a week or thereabouts.

The burrow is sufficiently deep to conceal the male in a few hours. Once inside the wood, further excavation alternates with periodic backward movements by which débris is thrust through the outer opening until the burrow has been carried approximately half an inch into the wood. By this time females are common on the surface of the log and the sexes become associated in the one burrow in unusual circumstances. The female passes from burrow opening to burrow opening until she locates a suitable burrow tenanted by the male only. She waits there patiently until he makes one of his periodic visits to the mouth of the burrow with surplus débris, and then, by dint of caresses in which both forelimbs and head appendages are used, coaxes him from the burrow, often after repeated failures. The female then enters the empty burrow and is immediately followed by the male. The subsequent extension of the burrow system is now a function of the female, the accumulated débris being thrust outside the log by the male.

Mating has not been observed, but, as eggs may be laid while the burrow system is still a single undifferentiated tunnel, fertilization must be effected in the first instance outside the log. Eggs may, however, be laid by the parent female at various points in the burrow system over a period of some twelve months; hence it must be presumed that the initial mating ensures fecundity for that period or that further matings occur in the log as the burrow system is elaborated.

Eggs may occur singly or in groups wherever the burrow lies in a horizontal plane, but they are commonly found in special arms of the burrow system more or less isolated from the main thoroughfares. The reproductive capacity of the species must be considerable, for some hundreds of immature forms may be distributed through the one burrow system. Exact estimates are, however, impracticable, as the linkage of burrow systems initiated independently is apparently common when infestation is heavy.

Eggs hatch during the summer within one month, and larvæ subsequently collaborate with the female in extending the burrow system. Development requires twelve months, and by that time burrows have been carried well into the heartwood of the log. The whole of the wood tissue is thus exploited by a network of burrows in a plane at right angles to the length of the log. Eggs and larvæ of all ages are then distributed through the burrow system.

Prior to pupation, mature larvæ congregate in branch burrows and excavate pupal chambers, which are grouped in typical Platypodid fashion. The chambers in any one group lie on both sides of the burrow in the one plane. The chambers are thus parallel to the length of the log and follow the grain of the wood. Chambers on opposite sides of the burrow usually alternate—a phenomenon which may be due to contemporary chamber excavation by the larvæ. The chamber dimensions correspond with the size of the enclosed insect, being normally 4 mm. in length, though there is some variation with the sex of the occupant, female pupal chambers being rather longer than those of the smaller male.

When transformation within the pupal chamber is complete, the adults break through the sealed mouth and re-enter the main channels of the burrow system. They ultimately escape from the log either through the outer surface or fissures leading to the outside. In any case, the insects do not use the original opening made by the parents and blocked by the body of the male, but construct independent exits. A number of these may be seen in any advanced burrow system, and it appears that several emerging adults share the one exit burrow.

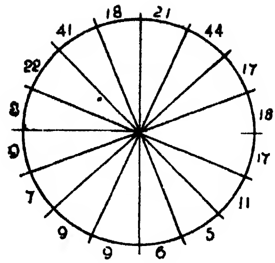
In all probability, only a single generation occurs in the log. The offspring of the original parents require some two years for the completion of development, allowing egg-laying for twelve months and a further twelve months for larval growth. If *C. grevilleæ* remains in a log for more than two years, the phenomenon can best be explained by delayed initial infestation rather than presumed multiple generations in the log.

Behaviour on the Log.

Though adult insects wander at random over the surface of the log, the subsequent disposition of the burrows is not uniform, and suggests preferences of some significance to the insect. In one observational log concentric rings of the bark, 1 ft. across, were removed to expose the underlying sapwood. When infestation was complete, the burrow mouths were counted and their location noted. A typical example is portrayed diagrammatically (Plate 183, figs. 1 and 2), and indicates quite clearly that the maximum infestation occurs on the latero-dorsal surface, and diminishes towards both the top and bottom of the log.

In experimental material, split and sawn surfaces in different parts of the log were exposed to infestation and log sections were placed in many different positions for observational purposes. The incidence of infestation on these sheds some light on the behaviour of the species, and significant points are—

(*a*) Where a bark edge impinges on sapwood, the burrows tend to be concentrated in the 2 or 3 in. of sapwood adjoining the bark. Their distribution is illustrated diagrammatically (Plate 183, figs. 3 and 4).



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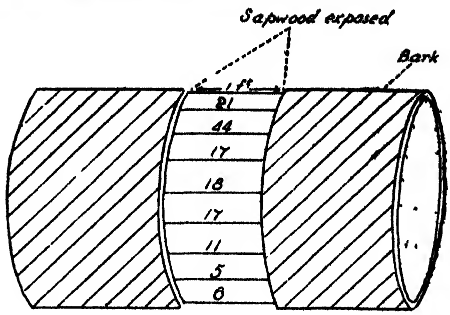

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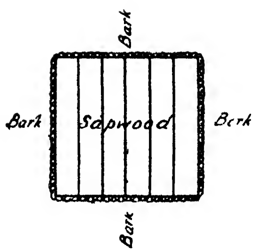

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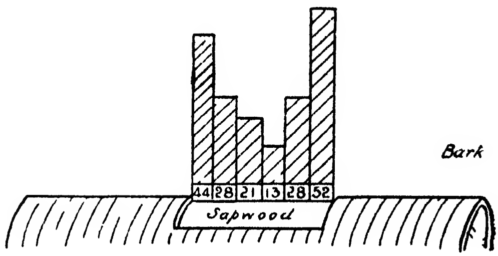

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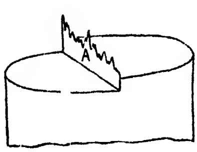

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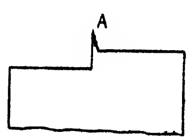

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I W Helmsing (after Smith)
1935

PLATE 183.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

FIG. 1—Diagram showing infestation round log. Each sector 9 in. by 12 in. Fig. 2—Diagram showing position of exposed sapwood and varying intensity of infestation on side of log. Fig. 3—Diagram of 1 square foot of exposed sapwood on upper side of log. Burrow concentration at bark-sapwood edges thereon shown in Fig. 4. Fig. 4—Diagram of burrow density in 2-in. strips showing concentration of infestation at bark-sapwood edges. Fig. 5—Splintwood on tree stump (semi-lateral view). Fig. 6—Splintwood on tree stump (lateral view).

(*b*) During felling, two horizontal cuts are made with a crosscut saw on opposite sides of the tree. The tree frequently collapses before these independent cuts meet, and between the two a certain amount of fracturing takes place. Splintwood at the fracture normally suffers heavier infestation than the rest of the exposed surface of the tree stump. The position of such splintwood is indicated in Plate 183, figs. 5 and 6.

(*c*) Infestation on a horizontal surface is usually slight; thus, the upper surface of the tree stump escapes with comparatively light attacks, while barked surfaces at its side are burrowed into freely.

If *C. grevilleæ* were unaffected by outside influences, a randomised infestation of susceptible surfaces would be expected, but these examples suggest that some factor or factors induce variable attacks. The pedal disability of the insect apparently has some importance in this connection. Both sexes find it difficult to retain a foothold on wood surfaces facing the ground; hence they readily fall from the log should their movements be obstructed by burrow débris. Burrow initiation presupposes a firm grip of the log surface—a condition better satisfied on the upper than the lower side of the log. Pedal disabilities would thus stimulate burrow initiation on the upper surfaces of the log or stump. Were it otherwise, the under surface of the log would be the obvious place for the adults to initiate burrows, as that region is less subject to extreme solar influences than other parts of the log.

A second factor of some importance is undoubtedly thermal. On a flat exposed surface solar influences are evenly distributed, while on the rounded surface of a log temperatures reach their maximum at the top, diminishing along the sides to a minimum below. Ordinarily the inception of new burrows in the open is restricted to a few hours before and after noon. When log-surface temperatures are very high, the adults show a great deal of distress and are almost incapable of initiating burrows. It seems clear, then, that extremes of heat on the upper surface of a log will tend to force would-be burrowing insects to the sides. An example is afforded by the stumps of trees felled under conditions suitable for infestation. Few burrows are then initiated in the upper surface, while susceptible wood elsewhere suffers severely. The effective burrowing period on any log surface, if controlled solely by temperature, would thus be least on the top of the log and greatest below

The actual concentration of burrows on the latero-dorsal surface thus seems to be a compromise between the two main limiting influences —pedal disability and surface log temperature, the former inhibiting burrow initiation below, the latter above, the log. Pedal disability is, however, a permanent influence and contrasts with thermal limitations, which operate only during the hotter parts of the day.

From the examples cited it seems that the distribution of burrows on exposed sapwood represents an attempt to reconcile various influences tending to inhibit burrow formation. The concentration of burrows on the latero-dorsal surface is apparent only when the bark has been removed from the tree or the log either completely or in strips. Should the insect population be considerable and the area of exposed sapwood limited, heavy infestation is practicable regardless of its position. The distribution of burrows from log to log may thus vary with the incidence of the pest and the position and amount of exposed sapwood.

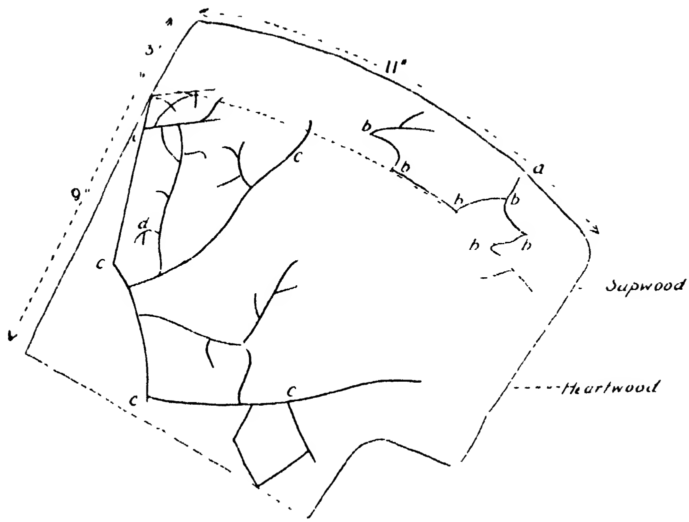
The urge to burrow is so evident in the male that, given suitable wood surfaces, excavation begins immediately. The preference for perpendicularly placed splintwood is probably due to the partial elimination of disturbing solar influences which normally operate on horizontally exposed surfaces, together with the added chemotropic attraction associated with ruptured wood tissue.

The aggregation of burrow openings on sapwood surfaces near a bark edge is rather striking, though the stimulus causing it is somewhat conjectural. Possibly the greater incidence of infestation is due to the increased chemotropic attraction associated with centres of sap exudation. At a bark edge the main conducting tissue of the plant is severed, and a heavy fluid exudate is discharged in limited quantities from the injury. If, as seems probable, the adults respond readily to chemotropic influences, the concentration of burrows in the neighbourhood of the discharge would be expected to conform with the example illustrated in Plate 183, figs. 3 and 4.

The Burrow System.

The burrow system of *C. grevilleæ* has the same essential pattern in all logs or tree residues examined. Should the insect enter exposed sapwood on the side of the log, the burrow is carried directly into the wood for 1 or 2 in., and then tends to become more intricate. Some main leaders pass straight into the heartwood, while subsidiary branches cut across themselves and link the main leaders until the whole cross-section of the log has been exploited. The burrow system normally lies in a plane which cuts across the grain of the wood; hence a cross cut often discloses its main features. Plate 184, figs. 1 and 2, displays the essential features of two burrow systems examined. Long, sweeping tunnels pass straight into the centre of the log, and in the heartwood subsidiary linkage yields quite a complex burrow system. Complexity is not, however, confined to the heartwood, for the distinction between sap and heart woods—so important to many timber-borers—has no influence on the habits of *C. grevilleæ*—at least, in the rain-forest species studied. At various depths subsidiary tunnels of no considerable length end blindly in the wood and invariably lead to series of grouped pupal chambers.

The final burrow system as illustrated in Plate 184, fig. 2, is the joint work of original infesting adults and their progeny, though the precise contribution of each is uncertain. The parent insects initiate the burrow and carry it down to a depth at which the first batch of eggs are laid. From time to time the female excavates branches in the inner recesses of the heartwood, where further eggs are laid, but the male plays a more or less passive role after mating is completed. It is inferred that the immature forms are chiefly responsible for burrow extension, though the tunnels excavated by the females for the reception of eggs may play a part in forming the main pattern. In the specimen under discussion there are three, and possibly five, burrows leading to the periphery, and it is a moot point whether all these represent points of adult ingress or egress. As some of the main leaders link well within the heartwood, they probably represent inward paths and indicate a linkage of burrow systems, the whole housing the progeny of several original parents. Egress through fissures has been demonstrated in commercial logs, but cannot be the only method of escape, for fissures may be absent from some timbers—*e.g.*, kauri pine, in which development is completed. Newly emerged adults may escape from any surface, and possibly some of the burrows leading to the outside in this specimen



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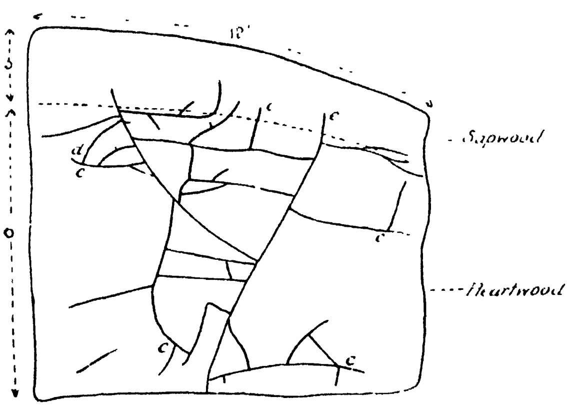

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I. W. Helmsing (after Smith)
1935

PLATE 184.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Figs. 1 and 2—Burrow systems in walnut bean: (*a*) Entrance burrow; (*b*) sapwood elaboration; (*c*) heartwood elaboration; (*d*) blind tunnels communicating with pupal chambers; (*e*) exit burrows.

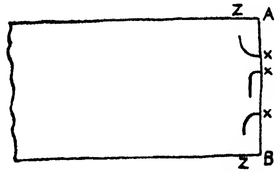
have been excavated by escaping forms. The importance of either mode of escape will largely depend on the character of the wood attacked.

Under natural conditions in the rain-forest, limbs are often attacked in fractures induced by the fall of the tree. Wood thus exposed is infested, though the limbs may not be more than 12 in. in diameter. Under such conditions burrow extension proceeds normally until halted by the bark on the opposite side of the limb, the larvæ often not having reached maturity. Deviations from the normal burrowing habit allow the completion of development, and the adults subsequently escape through the bark. The burrow system peculiar to limb infestation differs in some respects from that in logs cut from the bole of a tree. In these the burrow system is normally confined to a single plane which cuts directly across the grain of the wood. Sawn sections thus expose a large part of the system, while split sections—which naturally follow the grain of the wood—cut across a number of independent systems, each of which appears as a linear series of burrow intersections (Plate 185, fig. 3). Linkage between these has not been seen in commercial logs. In limb infestation, however, burrows along the grain may link separate cross-grain burrow systems or parts of the one system. The connecting burrows may be some inches in length and located at various depths in the wood. A high insect population in a limited wood volume is apparently the cause of the abnormality, for similar connecting links occur when bark infestation is attempted by this species without successful penetration of the sapwood. Here reproduction occurs within the narrow limits of the bark, and some relief would obviously be gained by burrow deviations along the length of the log.

Limb infestation produces a further aberration. When bark is peeled from infested limbs some considerable time after burrow initiation, it is not uncommon to find a network of tunnels on the sapwood surface (Plate 185, fig. 4). These burrows house larvæ in all stages, and occur when further development is hampered by the limited cross-section of the limb. These sapwood surface markings resemble those frequently constructed by *Xyleborus hirsutus* Lea, and usually occur when a large insect population is working in a limited space. Similar phenomena have been noted for other Platypodids.

Lateral infestation is by no means the only method of *grevillea* penetration, for end infestation of the log through the sawn surface, particularly the sapwood, is also common. In such cases the burrow follows the grain for a short distance, but ultimately, and characteristically within 1 or 2 in., swings round into the trans-grain direction, when burrow elaboration proceeds as usual (Plate 185, fig. 1). The actual angle at which entry is made does not alter the general position. Adults entering the stump of a tree at the horizontal sawn surface ultimately construct a burrow system in the horizontal plane, while those entering the ends of a cut log finally work in a vertical plane. Burrows parallel to the grain of the wood are thus an exceptional device used in certain circumstances to facilitate the exploitation of the available wood.

The lateral spread of the burrow system from a limited point of entry was clearly demonstrated in some experimental material. Plate 185, fig. 2, illustrates a diagrammatic cross-section through a limb in which the sector AB was the only point of entry. The shaded area indicates the wood tissue exploited by the insects after ten months. The extension of the burrow system is seen to proceed in all directions, though the rapidity of exploitation is greatest in the radial line. Ultimately the whole of the wood may be riddled in the one particular plane.



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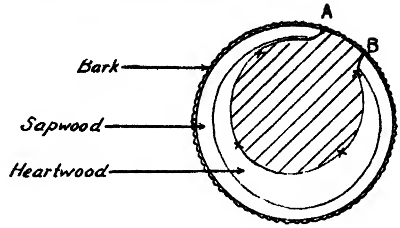

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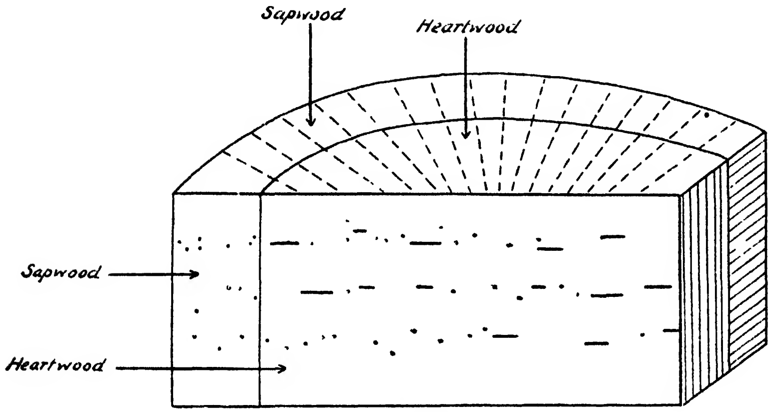

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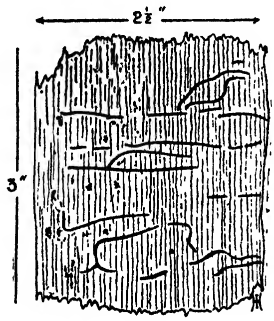

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I W Helmsing (after Smith)
1935

PLATE 185.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1—Diagram of burrow formation following end infestation of log. Infestation at xxx on end surface AB. Burrows subsequently excavated in plane ZZ at right angles to length of log. Fig. 2—Diagram of lateral spread of burrow system. Entry at sector AB only. Limits of burrow system xxxx. Fig. 3—Section of walnut bean intersecting three burrow systems. Note that each burrow system cuts across the grain of the wood. Fig. 4—Walnut bean showing sapwood surface burrows beneath the bark.

Feeding Habits.

The tunnels of pinhole borers are usually discoloured through the action of fungi which subsist on the walls. When burrows are vacated, the tunnels may become blocked with a compact hyphal mass, which is often sufficiently cohesive to remain intact when the log or log section is broken up for examination. Prior to this stage the fruiting bodies may be seen fringing the walls. A number of these fungi have been cultured on laboratory media and examined by R. B. Morwood, M.Sc., Assistant Plant Pathologist, who has determined the two chief as examples of the genera Monilia and Pennicillium. Fungi in the genus Monilia are usually regarded as imperfect stages of the higher Ascomycetes.

Pinhole borers have been frequently designated "ambrosia beetles" —a name given because some, if not all, feed on fungi cultivated on the walls of the burrow system. More recently it has been suggested that the larvæ are essentially sap-feeding in habit, subsisting on wood exudates rather than fungal growth. Some inferential data indicate that both methods of feeding are normal to *C. grevilleæ*.

After burrow initiation, débris is thrust from the burrow mouth for some weeks until egg-laying begins; thus, presuming that sustenance at reasonably short intervals is necessary for the adults, their requirements must be met, in the early stages of burrow excavation at least, by sap exudates from the wood tissues broken down.

Within a short period of burrow excavation the walls show some discolouration, which, in part at least, is attributable to the establishment of fungi. Were the growth of these unchecked, the mycelial development would soon block the burrows, and the insects must crop down the fungi if free movement is to continue. Under some circumstances, both larvæ and adults live in a burrow system which is not being extended; thus, after heavy infestation in injured bark, a numerous insect population may subsist in a burrow system which cannot for some months be carried through to the sapwood. Growth and development of the insect are normal, and it may be presumed that the fungal growth on the burrow walls is a satisfactory food during the period.

It appears, therefore, that both fungal and sap-feeding habits can be correctly ascribed to the insect. Possibly fungi are the normal food of *C. grevilleæ*, while sap exudates may serve as an auxiliary food when mycelial growth is not available, or in conjunction with it when burrow extension is in progress.

Duration of Tenancy of a Log.

Under natural conditions, the greatest injury is caused by insects which gain access to the log or felled tree at exposed sapwood surfaces. In the newly cut and handled log most of the sapwood is protected by bark, but after subjection to weathering the bark may fracture, and *C. grevilleæ* penetrates the freshly exposed wood surfaces. This process of bark-loosening may cover a considerable period, and permits the infestation of any one log for some months. The pinhole borer population of a log may thus include the progeny of adults which have gained access to the wood at any time between the date of felling and its removal from the rain-forest environment. Fresh infestation has been observed in the rain-forest on logs felled nine months previously, and the end effect is simply the co-existence of burrow systems initiated at

different times. Under such conditions, it is sometimes difficult to decide whether the known Crossotarsan tenancy of a log is merely the life-cycle of the first invaders only or this plus the difference between the dates of first and last new infestation. Ultimately, however, the whole of the heartwood may be riddled, and this phenomenon is common in commercial logs of, say, 12 ft. girth after a period of eighteen to twenty-four months. Even then immature forms may be found which require some months for the completion of their development. It follows, therefore, that *C. grevilleæ* may be found in logs for three years after felling, the period depending entirely on the suitability of the wood for insect development. Specimens of freshly-cut heartwood from six or seven-year-old logs exercise some attraction for the insect and permit fresh infestation, but under ordinary conditions superficial drying of the sapwood prevents the attraction latent in the core of the log being felt outside. The exposure of the inner wood by either saw or axe merely opens the way for fresh infestation.

Under normal conditions, the Crossotarsan tenancy of the log will thus depend entirely on the amount of wood volume and its stimulus to fresh infestation, the latter being controlled by the rapidity of superficial drying and the presence or absence of freshly exposed surfaces. In some timbers the insect will remain in possession until the whole of the wood is exploited, while in others changes in the wood itself, such as occur in softer species, will compulsorily end the tenancy in a relatively short time.

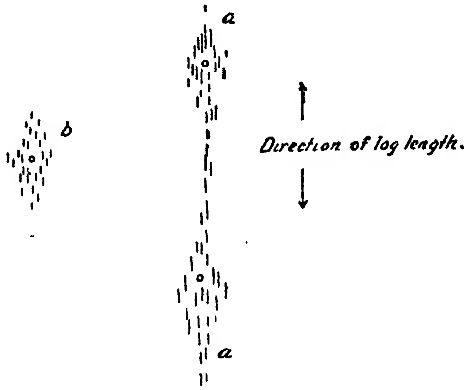
Wound Injuries in the Living Tree.

Wound injuries in which the bark is stripped from the sapwood of the tree are common in the rain-forest, and insects frequently attack the damaged tissues. Sometimes the dimensions of the burrows correspond with those of *C. grevilleæ*.

In 1933 a strip of bark was removed from a standing tree on the edge of a rain-forest clearing during the summer months. Males of *C. grevilleæ* were immediately attracted to the exposed sapwood and initiated burrows, though the rate of infestation was less than in adjacent susceptible log material. Mating subsequently took place and immature forms were recovered from the burrows, the development of the burrow being similar to that commonly found in ordinary felled material.

By analogy with the behaviour of *C. grevilleæ* in logs, the burrow system would be carried further into the wood and the adult progeny would subsequently emerge through the bark. Pupal chambers have not, however, been found within the infested wound tissue, and development may not be completed. Possibly successful reproduction in injured trees depends on the vitality of the plant, for a heavy flow of sap may be inimical to free development of the insect.

A special type of injury is to be found when a tree strikes another in the path of its fall. The bark is then stripped from a tree as before, but at one particular point the sapwood tissue is crushed by the violent impact which takes place. The infestation per unit area at these points is always much greater than at other parts of the exposed sapwood, regardless of other influencing factors. Should the infestation be low, *C. grevilleæ* may attack areas of crushed wood in either the standing tree or the cut log to the exclusion of other susceptible parts. Apparently the chemotropic stimulus associated with infestation is intensified where the sapwood has been crushed



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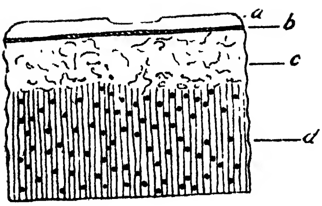

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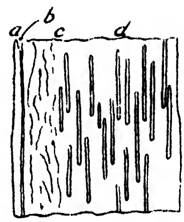

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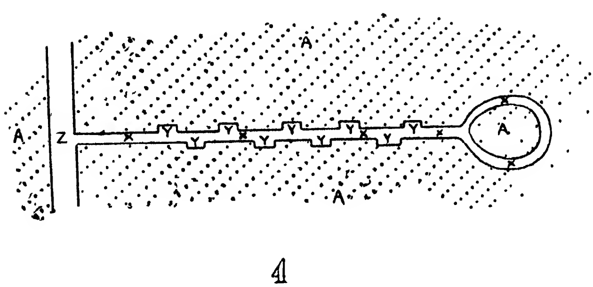

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I W Helmsing (after Smith)
1935

PLATE 186.

PINHOLE BORER (*Crossotarsus grevilleæ* Lea).

Fig. 1—Diagram showing discoloured wood tissues adjacent to burrows in living tree: (*a*) Burrows in alignment; (*b*) single burrow. Fig. 2—Diagram showing section through bark of walnut bean: (*a*) Surface corky layer; (*b*) hard whitish layer; (*c*) compacted tissues in process of dissolution; (*d*) matrix of bark showing sclerophyllous columns. Fig. 3—Diagram showing longitudinal section through bark of walnut bean: Details as in Fig. 2. Fig. 4—Diagram of suggested canopy ramp: (A) Rain forest; (X) track under canopy, with turning facilities for teams at end; (Y) dumps for logs; (Z) main teamster track.

Wound injuries of a similar type have been noted in the rose butternut, *B. involucigera,* but these have been caused by the comparatively rare borer *Platypus* sp.

Infestation of the felled log usually induces some discolouration of the wood immediately surrounding the burrow path, the discolouration spreading equally in all directions through the sound wood. In burrow-riddled sapwood of the living tree the discolouration causes a diamond-shaped blemish, the long axis of which is parallel to the bole of the tree. It would thus appear that the fungus or associated organisms responsible for the discolouration are distributed for some distance along the natural lines of fluid conduction in the ordinary transport medium. Should burrows approximate, the fusion of discoloured areas may result, and an example is diagrammatically shown in Plate 186, fig. 1. The discolouration varies from species to species in both extent and colour, rose butternut being a striking example in which the discolouration is a bright yellow, the blemishes covering an area of some square inches.

Significance of Log Faults.

Most commercial logs cut in North Queensland show defects. These flaws are of some moment in the insect economy as they may permit the entrance of adults and the exit of their progeny after the completion of development. The most important flaws may be grouped as follows:—

(*a*) Radial cracks through the centre of the log which may, following fungal breakdown with or without white ant invasion, develop into pipes of some kind or other. Except in so far as these represent the loss of a given volume of wood, they do not present complications in the mill, for trimming is a simple matter when the log is being sawn into flitches. In view of their frequent occurrence in the North, the cause must be common to the whole of the northern area and may possibly be associated with cyclonic blows. After felling, these flaws, whether of the fissure or pipe type, remain comparatively stable, though they may penetrate through the greater part of the commercial length of the tree.

(*b*) Ring shakes and their variations are common features in logs examined on ramps or in timber yards. If located near the periphery of the heartwood, they may not interfere greatly with bench manipulation of the log, but otherwise they may determine the angle of each cut in order to keep wastage to a minimum. In such logs the cutter may have to choose between incurring waste to procure a patterned veneer and sacrificing pattern for the maximum area of wood. In the log they appear as open fissures which, when traced to the point of origin in the stump, are parallelled by obvious weaknesses in the wood. The fissure of the shake is due to the joint influence of the impact at the time of felling and the shrinkage in log volume which takes place later. Logs which show shakes at the time of felling become progressively worse, for shakes tend to extend and often link up by fissures to a central flaw.

Though fissures serve as a convenient channel of escape for emerging adults, their presence or absence makes little or no difference to the development of the species in the log. In a faulty log, adults may escape either through fissures or through the outer surface, and normally both channels are in use, though if sapwood decay is far advanced, fissure

escape is the more important; hence, in the absence of fissures near the core of the log, adults can retrace their steps to the periphery through the ramifications of the burrow system and construct independent exits.

Some infestation does take place through fissures, but only near the outside of the log. Apparently conditions in the inner recesses do not attract the insect. The absence of fissure infestation is mainly due to the unsuitability of the temperatures in the fissure for mass infestation. The actual loss of timber through the burrows initiated towards the outside of the fissure is normally not great, for the burrow systems initiated usually keep to the radial plane and the body of the log remains unaffected.

End infestation of a peculiar type has been observed in a defective water gum, *E. gustavioides*. A ring of tissue some 4 in. from the bark edge was riddled with entrance burrows of *C. grevilleæ*, while that on either side was free from attack. Particular rings of tissue similar to this are not uncommon, and may be due to irregular growth associated with over-maturity, the wood cutting white when dressed in the mill. Perhaps wood of this type represents a structural flaw in which the wood elements differ from the remainder of the log.

A further phenomenon associated with changes in the wood, but here due to fungal contamination, is frequently found in parts of a log showing signs of "doziness"—a tissue breakdown commonly found in logs. Heartwood tissue showing signs of incipient fungal breakdown frequently suffers attack on a heavier scale than healthy tissue alongside.

It seems clear from the examples cited that changes in the tissue of the wood due to a variety of causes may increase its susceptibility to pinhole borer attacks.

Natural Predators.

The described activities of *C. grevillea* are sufficient indication that for at least one phase of the insects' existence parasites can have little influence on the borer population. In the log predators of only the smallest dimensions can come in contact with the insect, and though Clerid larvæ are occasionally found within the burrow system, they apparently make no appreciable difference to the actual *grevilleæ* population; hence, once the burrows are initiated and inhabited by the two sexes, development proceeds normally. The only inhibitions of any consequence depend on the hardness of the wood and the virility of the fungi which take possession of the burrow walls. Should the log be one of the softer wood types—*e.g.*, *Panax Murrayi*—normal disintegration may proceed so rapidly that the wood is reduced to pulp before the development of the insect can be completed, and larvæ, unable to thrive in such a medium, fail to mature. A further danger in such soft woods is to some extent associated with the first, for the growth of burrow-frequenting fungi is particularly rapid. It is not uncommon to find all stages of the insect enveloped in a mycelial mass, the growth of which has been too rapid for the insect population in the burrow system to control. Most rain-forest hosts, however, permit the normal development of the insect, and predatory influences within the burrow are slight.

The free-living habits of the insect are almost unknown except when infestation of a log is taking place and susceptible surfaces are crowded with adults seeking to penetrate the log. They are then subject to predatory dangers, for they lack adequate means of self-defence and

work in exposed situations. It is not surprising that rain-forest Formicids should carry off a considerable number of the borers. Three species are implicated:—

(*a*) *Chalcoponera impressa* Mayr. captures the adults as they move over the surface of the log prior to initiating burrows. It is particularly vindictive and very rarely loses its prey. Not only vagrant adults are taken, but males within the burrow system may be captured as they thrust burrow débris through the outside opening. The hind portion of the body is then extruded, and the ant often remains poised above the burrow opening waiting for a favourable opportunity to seize its prey.

(*b*) *Meranoplus puryi* For. is a smaller species which is more timid in habit than the former. Though it does sometimes capture adults, it is by no means so effective a predator as *C. impressa*; hence, though it may capture the prey either on the surface of the log or at the mouth of a burrow, the victim may be dropped should it show any considerable resistance. Most of the successful captures are injured borers.

(*c*) *Pheidole* sp. is a minute fulvous form smaller than the borer on which it preys. It wanders less than the preceding species and haunts stumps rather than the felled log. It may there be found carrying off *C. grevilleæ* in a very efficient manner.

The Clerid *Omadius yorkensis* Kuw. may also occur on the log surface frequented by borers. As would be expected from its systematic affinities, it is predatory in habit.

These four predatory insects are found on most logs subject to *grevilleæ* infestation and readily destroy any of the borers with which they may come in contact. It is doubtful, however, if they hinder the successful exploitation of a log. There are many reasons for this. The bulk of the burrows are initiated during the first day after the exposure of the sapwood. An influx of predators to a log presupposes an earlier invasion by their prey, and there must always be an interval between the two events. This interval, even if relatively short, gives the males sufficient time to burrow into the wood, for the predatory insect population is not high until a week or so after felling. These predatory insects therefore exercise no appreciable limitation on the number of burrows initiated within a week after felling a tree. Predators may, however, frequent the log concurrently with the females of *C. grevilleæ* and thus impede the normal juxtaposition of the sexes in any one burrow. This may account for the occasional phenomenon in which a log or part of a log is infested with males unpaired even after a lapse of some months. Predators may also limit subsequent infestation on surfaces exposed after the log has been cut.

Burrows sometimes harbour a considerable mite population which preys on the immature stages of *C. grevilleæ*. The net effect may not be great unless the insect population in a restricted wood or bark area is high. Under special circumstances, the loss is appreciable, a common example being found where bark infestation has taken place in mature logs. Infestation has in this case been stimulated by injury to the superficial bark layers, but the burrow system cannot be carried through to the sapwood, and immature forms crowd the limited burrow system which can be constructed in the bark itself. Apparently, conditions

within the bark burrows are suited to the rapid multiplication of the mite, and the larval mortality of the borer may be very high.

In spite of the variety of predators which are partial to *C. grevilleæ* both inside and outside the burrow system, it has to be concluded that their net effect is not great, particularly if weather conditions are suitable for mass infestation and the host log suitable for free development of the burrow system.

BARK RESISTANCE IN THE WALNUT BEAN.

It has already been noted that intact bark is capable of effectively protecting logs from pinhole borer attacks for some months after felling, and this fact has been used, in the previous paper, to suggest logging practices for surmounting ordinary borer difficulties. *C. grevilleæ* does, however, attempt to penetrate the bark, for in many logs small incipient burrows penetrating to a depth of 1 mm. or thereabouts are common. During 1932-34 a number of walnut bean logs varying in girth and bark thickness, characteristics depending on the age of the parent tree, have been under observation. In some of these *C. grevilleæ* penetrated the bark within three months of felling and infested the sapwood. In some instances, though cracks were absent from the bark, the discolouration of the underlying sapwood indicated that moisture soakage through it had already taken place. The insect-infested logs were of non-commercial size with a bark thickness of 8 mm., in contrast to the 12 mm. and upwards mean bark thickness of commercial logs; hence, while the generalisation on bark resistance holds good for the trade, the early breakdown in younger logs suggests an inquiry into the basis of bark resistance to the attacks of *C. grevilleæ*.

Resistance can be of only two types—chemical and mechanical. Were the former the case, some constituents of dead and dying tissues which constitute the greater part of the bark should be inimical to the activity of the insect. Were such constituents of the bark extractable, the liquor should have the property of preventing infestation in wood surfaces otherwise susceptible. An extract was prepared from walnut bean bark by the usual method employed in the manufacture of tannin liquor—*i.e.*, by leaching shredded bark for three hours at a temperature of 60 deg. C. The liquid showed some viscosity and was subsequently broken down with an equal quantity of water for actual log treatment. This extract ought to contain the usual contents of tannin liquors, including the gums, starches, mucin, zylans, inulin, and pectin. Surfaces dressed with the diluted extract actually suffered greater infestation than untreated sapwood, and it would appear that an aqueous bark extract has attractant properties. The heavy infestation of injured though unbroken bark confirms this conclusion. Though the bark after the removal of its water-soluble contents may still possess repellant properties, the behaviour of the aqueous extract suggests that bark resistance to attack is not due to its chemical constitution.

The alternative thesis—*i.e.*, that the mechanical properties of the bark determine its resistance to pinhole borer attack—is supported by both the behaviour of the insects and the macrostructure of the bark. The bark of the walnut bean (Plate 186, figs. 2 and 3) is not a homogeneous layer of variable thickness clothing the sapwood. It consists of at least three layers—

(*a*) An outer layer, homogeneous in structure, reddish in colour, and 1 mm. in thickness.

(*b*) A thin white subsurface layer which is quite hard and capable of being flaked with a scalpel.

(*c*) A diffuse layer comprising the greater part of the bark and made up of a crumbly corklike matrix, in which are interspersed columns of sclerophyllous tissue.

The sclerophyllous columns are roughly circular in cross-section towards the inner part of the bark, but near the periphery disintegration and coalescence take place; consequently, irregular masses of disintegrating sclerophyllous columns are strewn through the matrix, with some concentration near the subsurface layer cited as (*b*). Abortive burrows are common phenomena in logs of all ages. They penetrate layer (*a*), but stop short at layer (*b*); hence it would appear that the borer-resistant properties of the bark depend almost entirely on the latter. If the tree is of sufficient age as expressed in terms of commercial utility, this layer is complete, though of no considerable thickness, but in immature trees its evenness is less evident and thickness less obvious. It seems clear, therefore, that this layer has much to do with some of the characteristic properties of barks. Ordinarily, some months pass under rain-forest conditions before it ceases to afford protection. Water naturally or artificially applied then soaks through the matrix of the bark as a necessary preliminary to its being shed from the sapwood. In open country the breakdown is accompanied by a considerable amount of splitting, but in the rain-forest fungal penetration with associated rotting are more evident features. The natural process of bark-shedding can be greatly accelerated by the removal of the superficial layers (*a*) and (*b*) with either a rasp or a sharp knife. Pinhole borer infestation then takes place immediately through the matrix of the bark and later through the sapwood exposed when splitting takes place. Some months must elapse after felling before bark breakdown is similarly advanced under ordinary conditions, and it must be concluded that the weatherproofing and borer-resistant properties of the bark are largely attributable to the subsurface layer (*b*) and proximate parts of the bark lying close to the periphery.

In young trees of non-commercial girth the development of layer (*b*) is less advanced than in most commercial logs, and their bark breaks down more quickly; consequently, they cease to be borer-proof even before splitting has been initiated—within three months in some susceptible material. The balance between susceptibility and non-susceptibility to *grevilleæ* attacks in the walnut bean must therefore depend on the superficial layers of the bark and the amount of weathering to which the log or tree is subject. The main influence of weathering depends in turn on the prevalence of contact moisture, which tends to break down the soluble products concentrated in and near layer (*b*). When precipitation is high during the summer months, natural bark breakdown is rapid, though the protection which the bark gives to the log still covers some months.

In logs from which the superficial bark layers have been removed, bark infestation is as great, if not greater, than on exposed sapwood surfaces attacked at the same time; but, curiously enough, subsequent development may not be normal. Given reasonable weather after infestation of the sapwood, the burrow system is rapidly extended and populated with immature forms. After bark infestation in logs cut from mature trees, however, the sequence of events may be quite different.

Burrow development is here inhibited at an early stage, though reproduction continues normally; consequently, some experimental material showed the remarkable phenomenon of heavy infestation and reproduction in the outer half of the bark only, immature forms being crowded together. The burrows lacked any definite orientation, and at the end of a few months had quite an aged appearance, the walls being almost black. Possibly in time the bark may be penetrated and an entrance effected into the sapwood, but it is interesting to note that normal development of the burrow system has been impeded by the inner bark. The limit of penetration coincided with the limits of weathering visible in bark sections.

Intact bark thus hinders the initial infestation of the log, while adults which enter injured bark surfaces may not be able to extend the burrow system to the sapwood. These properties of the bark are apparently due to physical features, layer (*b*) resisting primary infestation, while the closely apposed sclerophyllous columns of the inner bark hamper burrow extension. The experimental data are almost entirely drawn from walnut bean studies, but a comparison of barks in a number of commercial species suggests that the conclusions are similarly applicable, though both the hardness of layer (*b*) and the disposition of the sclerophyllous tissues differ considerably.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES, 1935.

June.

Marburg, 1 to 3.
Gin Gin, 1 to 3 .
Childers, 3 and 4.
Emerald, cancelled.
Wowan, 6 and 7.
Bundaberg, 6 to 8.
Lowood, 7 and 8.
Warrilview, 8.
Boonah, 12 and 13.
Gayndah, 12 and 13.
Gladstone, 12 and 13.
Esk, 14 and 15.
Rockhampton, 18 to 22.
Mackay, 25 to 27.
Laidley, 26 and 27.
Proserpine, 28 and 29.

July.

Bowen, 3 and 4.
Ayr, 5 and 6.
Townsville, 9 to 11.
Kilcoy, 11 and 12.
Cleveland, 12 and 13.
Rosewood, 12 and 13.
Charters Towers, 16 to 18.

July—continued.

Nambour Show, 18, 19; Campdraft, 20.
Cairns, 23, 24, 25.
Atherton, 30 and 31.
Gatton, 31 July and 1 August.

August.

Caboolture, 2 and 3.
Pine Rivers, 9 and 10.
Royal National, 19 to 24.
Home Hill, 30 and 31.

September.

Brisbane River Carnival and Campdraft, Esk, 6 and 7.
Imbil, 6 and 7.
Pomona, 13 and 14.
Tully, 13 and 14.
Rocklea, 14.
Beenleigh, 20 and 21.
Innisfail, 20 and 21.
Kenilworth, 28.

October.

Malanda, 2 and 3.

A Novel Moth Lure.

By HENRY HACKER, F.R.E.S., Entomologist.

RECENTLY a very interesting spider was forwarded to the Department of Agriculture and Stock for identification, and as it possesses some remarkable habits, a short account of these may be of general interest.

Most spiders catch their prey by means of a web or snare. The species now under discussion—*Dicrostichus furcatus* Cambridge—belongs to a group the members of which, however, are able to attract moths by means of a lure. Its nest or retreat is usually in a small tree or shrub and consists merely of a few leaves drawn together with threads.

PLATE 187.

Dicrostichus furcatus Camb. Female spider with lure × 2.

This spider is nocturnal, and when hungry it comes out of its retreat and spins a few inches of silken thread; one end of the thread is fastened to a twig, while to the other is attached an extremely sticky globule. The spider then takes up its position, holding the thread by one of its legs, and patiently awaits its victims (Plate 187). When a moth approaches, the spider whirls the sticky globule around. The nature of the attraction possesed by this globule is not known, but the moth invariably becomes attached to it. Moderate-sized Noctuid moths as well as smaller Lepidoptera have been observed falling victims to this attractive lure. When the spider effects a capture, it hauls up the thread, binds the moth with further threads, and proceeds to suck its juices.

The egg-bags of this species are very conspicuous objects; as many as four or even five may be seen suspended near the retreat, all being the work of a single female. They are nearly 2 in. in length, pale testaceous brown, wide at the point of attachment, then sharply contracted into a narrow neck, beyond which they are spindle-shaped. The outer skin is of smooth parchment-like texture; the interior is thinly lined with loose silk and filled with white globular eggs.

The young spiders hatch inside the bag and duly penetrate to the outer envelope, which they pierce. On emergence, each one spins a fine silken thread, then, loosening its hold, floats away. By this means they are dispersed for considerable distances from the original spot at which they hatched out.

HOW TO HOLD THE REINS WHEN RIDING.

During a discussion recently among a number of horsemen the growing practice to hold the reins when riding with both hands was severely criticised and defended with equal vigour by those who contended that it was the correct manner. Those who uphold the use of one hand only have solid backing for their views. Take the army as a case in point. Riders use only one hand, usually the left. The mounted police in this State use only one hand.

A dip back into the pages of the past depicting riders of other days, esquestrian statuary and paintings of horsemen of olden times will disclose riders with the reins in but one hand. It is the universal practice among Australian stockmen. In hunting or galloping, however, it is usual to use both hands.

Of late years the number of riders appearing in the show ring who use both hands has been very pronounced. No doubt this is the outcome of training in early youth. It is held by some that riders of this style maintain more effective control over their mounts. But what of such riders as the mounted police, who, time and again, have demonstrated the control they have over their mounts when riding with one hand?

Would it not be possible to set up some standard of horsemanship for the guidance of show judges as is done in other countries? In common with using both hands on the reins there has been a decided tendency for riders of the younger generations to use a very short stirrup—quite alright for hunting or galloping, but which looks out of place in the show ring.

It would be interesting, therefore, to have the views of experienced judges on these and other points upon riding in the show arena and elsewhere.—"Book Book" in "Country Life."

Quality in Bright Tobacco and Home Grading.

N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THERE is no doubt the dissatisfaction expressed by many tobacco growers at their inability to sell or to secure adequate prices for their product would be largely obviated if the essentials of quality were better understood.

Complaints are made of inconsistency in the offers for lots of high grade leaf that growers maintain were of equal quality, but the greatest outcry is due to the low prices realised, or the lack of offer, for dark and inferior leaf.

In the absence of keen competition amongst purchasers, it is probable the prices for even grades of good quality may vary somewhat, but is has not been observed that such disparity was, in any season, extraordinarily remarkable. The prices, however, paid for inferior grades have shown divergences for which satisfactory reasons cannot be adduced. Such disparities infer that below a certain standard the degree of quality is not always a determining factor. They certainly show very plainly that inferior grades are not desired.

In any question there are at least two points of view, in that of quality of tobacco, there are certainly three—namely, the grower's, the manufacturer's, and the consumer's. Of these, that of the last named is the most important, since his inclination impresses the manufacturer and thus influences the demand from the grower. In this direction buyers have shown by their ready purchase that all bright grades, exclusive of trashy leaf, as well as the best of dark grades, are in good demand and by their reluctance that inferior grades, especially of leaf harvested under-ripe, are not desired.

In Australia the average quality of tobacco demanded by the consumer has been stated by competent authorities to be superior to that in other lands. This is no doubt due to the fact that until quite recently well over 90 per cent. of that consumed was imported in leaf form or already manufactured. As duty is paid on weight without regard to quality, it is improbable inferior leaf received any consideration from importers. Growers, therefore, should fully realise Australian consumers, on the whole, desire a quality to which they are accustomed and cannot be expected to take kindly to an inferior article. Also, the habit of smoking is encouraged by the satisfaction experienced therein. Any measure calculated to enforce the consumption of an inferior quality, such as by a partial or total prohibition of import or by the imposition of such an increase in duty as would result in the price of the article rising beyond reach, could not be calculated to help the grower. Rather would consumption rapidly decline and the market be still confined to leaf of reasonably good quality.

It should also be remembered that popular taste in tobacco has shown a marked alteration, especially in the last twenty years. Such a change appears concurrent with the general adoption of the flue-curing process. Efficiently so cured the leaf, when grown under the most

suitable conditions of soil and climate and harvested at the correct stage of ripeness, possesses a natural flavour and aroma, so satisfactory as not to suggest possibility of improvement. As a result of this, a modification in the process of manufacture eventuated. Formerly it was the practice to treat the leaf with various sauces, to add aromatic substances and by other agencies, to overcome deficiencies or seek improvement in flavour and aroma. To-day the art of manufacture consists most largely in the blending of various grades of leaf to secure a degree of natural flavour and aroma calculated to make the greatest appeal to the consumer. The reagents now employed in the process of manufacture, being in themselves neutral, are not calculated to cover any deficiency or to add in any way to quality.

As is well known, leaves borne on different parts of the plant and classed, respectively, as lugs, wrappers, fillers, and cutters, vary in size (superficial area) and body (thickness) with the climatic conditions and the class of soil on which the plant is grown. In proportion as body increases so does the content of nicotine and other properties that combine to produce flavour and aroma.

The smoking aroma also will vary somewhat with the district—more particularly in relation to degrees of latitude in Australia—and with the country. Regarding the latter there is a pronounced difference between the aromas of Australian, African, American, and Asiatic tobaccos, though the best of each is most agreeable.

Further, the aroma of certain kinds of tobacco leaf such as Burley, Turkish, &c., are distinct from that of bright tobacco wherever grown. In addition, the ageing or storage of leaf under appropriate conditions for a year or more is found to result in improvement in smoking quality. A parallel to this is suggested in the ageing of wine or whisky when held in wooden casks. The reason of the improvement is not understood and, so far, no process has been found to produce the same effect with either tobacco or wine. The storage of tobacco leaf, however, beyond a year, appears to be confined to the choicer grades, of which the supply is not certain each year. Manufacturers thus have at their disposal Australian leaf of varying degrees of strength (flavour and aroma) according to body and the district in which it was produced. They are also able to import from other countries bright leaf and leaf of other kinds in which flavour and aroma are distinct from Australian as well as each other. Opportunity is consequently afforded to blend Australian leaf of various grades in definite proportions to secure smoking mixtures calculated to satisfy the varied requirements of consumers.

Under competition, it is natural for efforts to be made to secure a greater share of patronage by providing further blends to titillate the palate. Thus leaf from foreign countries and of other kinds are used wholly or as admixtures.

With such an objective it cannot be expected that inferior grades of leaf will meet with consideration. Growers should be aware the demand for quality leaf is instituted primarily by the consumer. Also that when the price of the manufactured article is increased, economy will be effected in other directions or consumption lessened rather than attention be given to a cheaper and less satisfying substitute.

Quality Essentials.

The qualities of bright tobacco may be determined as "burn," "ash," and "aroma" in regard to smoking characteristics, and "size," "colour," and "texture" to leaf appearance.

Burn.—The ability of the cured leaf, when manufactured, to hold fire will be recognised as most important. When a pipe or cigarette has to be continuously drawn upon to keep the tobacco alight the burn is suggested as very poor. On the other hand when a cigarette or pipe can be set down for two or three minutes without a cessation of combustion the burn is characterised as very good or excellent. Similarly with the leaf alone, when the glow ceases immediately it is taken from contact with a flame, it is said to have a bad burn, while if the line of fire proceeds slowly and evenly without flame or coaling for some seconds it is proportionately classed as fair, good, very good, or excellent.

A bad burning quality is generally due to an excess of chlorides in the soil frequently associated with sodium as common salt in areas close to the sea. The burn of Queensland tobacco leaf in present producing districts has been found to be uniformly good.[1] Care, however, should be exercised in the inclusion of chloride or muriate of potash in the fertilizer mixture as an excess beyond 2 per cent. besides exerting an unfavourable effect on the burning quality of the leaf is said to injure growth and produce a thick brittle leaf which, when cured, becomes thin soggy and dull in colour.[2]

Excess of nitrogen also is liable to affect the burn[1].

The burn of immature leaf is much less satisfactory than of that allowed to ripen on the plant.

Ash.—The colour and consistency of the ash of Queensland tobacco is also generally satisfactory[1]. It should preferably be light in colour, white to grey, rather than darker, and should be fine and soft to touch. The formation of a coal is not desirable.

Aroma.—It is somewhat difficult to define exactly what is covered by the term "aroma," since it includes the fragrance, or otherwise, noted by the olfactory nerves and the flavour and general effect registered on tongue and palate. The quality of aroma may be described as from poor to excellent, light to full flavoured, mild to very strong, and passable to agreeable, or, pungent, sharp, bitter, acrid, objectionable, &c., according to the effect experienced.

A good or agreeable aroma will be evidenced by a soothing effect on tongue and palate, accompanied by a feeling of fulness without heat in the mouth when the smoke is drawn in and a pleasurable effect on the sense of smell.

The taste of the cured leaf when chewed is also a guide to quality in smoking aroma; it should possess a degree of sweetness.

The quality of aroma as was previously noted varies with the district and again with the country in which it is grown. In each case it may be quite distinct but at the same time wholly satisfactory.

The degree of aroma or the amount present in the leaf is dependent on the texture, the position of the leaf on the plant, and the stage of ripeness when picked. It varies with varieties and with quality is affected by the soil and climate during growth. The middle leaves

being the largest leaves and also heavier bodied than others on the same plant, possess a greater degree of aroma than cutters or thin leaf, much of which is almost neutral or the degree of aroma so light as to be hardly perceptible. By blending leaves of differing body the degree of aroma is controlled in the manufactured article, while the quality may not be altered. By blending leaf of different kinds of tobacco, as well as that from different districts and countries, the quality, as well as the degree of aroma, is influenced. Leaf picked at the correct stage of ripeness and efficiently cured presents a much superior appearance and possesses flavour and aroma to a fuller and more acceptable degree than when harvested either under or over-ripe.

A parallel may be noted in the greater attractiveness of dessert fruits when allowed to become fully ripe before being picked from the tree.

In proportion as the harvested leaf departs from full ripeness so will its smoking quality decline. Over-ripe leaf when cured is found to have less aroma and usually carries an amount of dead tissue proportionate to the period beyond which it should have been picked.

Under-ripe leaf also carries less aroma both in quality and quantity and, as it declines from ripeness, presents a more or less bitter and disagreeable flavour.

Though under-ripe leaf may by skill be cured a more or less yellow colour, buyers will detect immaturity by the leaf odour, which becomes more rank and objectionable with departure from ripeness.

Disease and frost are not infrequently the cause of defective aroma.

Rootrots and nematode infection induce a yellowing of leaf on the plant much earlier than the period of normal ripening. This colouring presages the decay of the leaf from lack of nutrition due to the defective root system. Such leaf is, of course, more or less under-ripe.

Heavy applications to the soil of dung or other manures which induce a rank growth through excess of nitrogen can also be responsible for bad aroma. Where suckering is neglected the aroma of the leaf is less in quantity rather than quality.

There has been some disagreement amongst authorities as to the relative importance of soil and climate in influencing aroma in tobacco, but in recent years preponderance of opinion suggests that the character or quality of the aroma is due to the soil and its degree or quantity to climatic influence.

Little is known of the leaf constituents responsible for aroma in tobacco or of any method of soil treatment that would result in improvement. It is, however, known that by certain additions it can be impaired, so it is reasonable to suppose the result of experiments in that direction may influence improvement in the future.

Slagg[1] found that ripe leaf grown in most of the Queensland districts possessed a good aroma. Manufacturers also, by their ready purchase of good textured leaf from all producing districts, have indicated appreciation thereof.

Being cognisant of the smoking characteristics of leaf from each district, buyers do not find it necessary to make a test before each

purchase. They are guided in estimation of quality by leaf appearance, particularly in regard to colour and texture.

Colour.

As indicated previously the smoking qualities of tobacco leaf covered by the term "aroma" are influenced by the soil on which it was grown, the seasonal conditions then operating, the stage of ripeness at which it was picked, and the efficiency of cure. Brightness of colour is an indication of the degree of ripeness attained when the leaf was picked and of the efficiency of cure. Its degree or lustre is definitely influenced by the amount of organic matter in the soil.

In fully-ripe, well-grown leaf that has been properly cured the colour range from lemon to dark will indicate increase in body. Under such conditions it would be equally impossible to properly cure a heavy leaf a lemon colour or a light leaf mahogany or dark.

The colour range may be described as follows:—

Lemon.—The colour of a freshly ripened lemon or that of flowers of sulphur.

Orange.—As suggested, the colour of a freshly ripened orange or a deeper and more pronounced yellow than lemon.

Bright Mahogany.—Yellow with a reddish cast to pale red, sometimes barred with light red and yellow.

Mahogany.—Bright red or in which a red colour predominates.

Dark.—Dark red to a ruddy brown

Green.—As its name implies, any leaf wholly green or which has a decidedly green cast.

Colour shades may be expressed as (*a*) pale; (*b*) light; (*c*) true colour; (*d*) dusky; and (*e*) dark.

Finish.—The term "finish" alludes to the general appearance of the leaf, and is described as (*a*) flashy or bright; (*b*) clear; (*c*) normal finish; (*d*) dull; (*e*) cloudy; and (*f*) dingy.

Flash Tobacco.—There is a shining brightness as if the surface of the leaf reflected light, frequently associated with leaf from the first crop on virgin soil; also on soils in which the supply of organic matter is kept up. This by manufacturers is termed "flash tobacco," and always commands, other qualities being equal, a better price.

In certain manufactures where brightness of colour is considered an additional attraction to smoking quality such leaf is eagerly sought.

Clear Finish signifies absence of blemish from sponging during cure, injury from disease, insects, &c., or damage from other cause.

Normal, dull, cloudy, and *dingy* finishes are sufficiently informative, and suggest full or insufficient ripeness, over-ripeness, or inefficient curing. In the latter three the trouble is frequently caused when the barn is filled with leaf of unequal ripeness or when rise of temperature is unduly delayed or ventilation is faulty. "Sponging" is a term commonly applied to defective finish.

Fibre Colours.—In relation to the leaf colour, that of the veins is determined as conforming, blending, emerging, contrasting, and clashing.

Leaf Aroma.—This is distinct from what is generally understood by aroma as a smoking quality, and refers to the odour of the leaf, particularly when a quantity is freshly drawn from the bulk or package. Ripe leaf presents a sweet, attractive odour suggestive of honey. A barn of freshly cured ripe leaf often emits such a perfume when the door is opened. Also in the bulk shed the aroma of the cured ripe leaf is usually pronounced and remarkably pleasant. In proportion to the decrease from ripeness of the leaf when picked, so will the sweet odour be lessened or replaced with a rank, nauseous, and objectionable smell. "Wet dog" is a buyer's term for the disodour associated with cured unripe leaf. Though skill in curing may secure a more or less yellowish colour or one free from green in such leaf, it cannot dissemble the particular leaf aroma peculiar thereto. This quality of leaf aroma may possibly explain the variations in price of which much complaint is made by growers.

Maturity.—This is decided by colour and leaf aroma as (*a*) overripe; (*b*) mellow or thoroughly ripe; (*c*) ripe; (*d*) unripe; (*e*) immature; and (*f*) crude.

Cure.—This is expressed as well cured or by names indicating certain characteristics of excessive, insufficient, or improper curing.

Cleanness.—Freedom from foreign matter—*e.g.*, dirt, suckers, string, &c.

Texture.

Under the general term of "texture" are grouped a number of qualities determined by superficial observance as well as during handling. They may be briefly described as follows.—

Soundness.—(*a*) Sound (free of damage); (*b*) unsound (under 20 per cent. damage); (*c*) badly damaged (over 20 per cent.) The term "damage" refers to the effect of fungus or bacterial diseases which attack tobacco leaf after it has been flue-cured, such as mould during bulking; it includes tobacco having the odour of mould, must, or rot.

Injury.—This is distinct from damage, and is defined as hurt or impairment from any other cause. Injured tobacco shall include any dead, burnt, hail-cut, or ragged leaves; or leaves that have been torn or broken, frozen or frosted, sunburned or scalded, scorched or firekilled, bulk-burnt or steam-burnt, pole-burnt or house-burnt, bleached or bruised; or discoloured or deformed leaves; or tobacco hurt by insects; or tobacco having an odour foreign to the type; or tobacco affected by rust, frog-eye, mosaic, frenching, or other diseases. It is expressed as the amount or percentage of injury.

Flatness.—(*a*) Flat; (*b*) even or plain surface; (*c*) wavy, shrunken, or loosely drawn; (*d*) crinkled or puckered; (*e*) wrinkled or tightly drawn; and (*f*) curled, twisted, or distorted.

Texture.—(*a*) Fine; (*b*) good; (*c*) medium; (*d*) fair; (*e*) poor.

Smoothness.—(*a*) Silky; (*b*) smooth; (*c*) unrough; (*d*) coarse; and (*e*) rough.

Grain.—(*a*) Grainy, and (*b*) not grainy or free of grain.

Porosity.—(*a*) Spongy; (*b*) porous; (*c*) open weave; (*d*) close weave; and (*e*) tight weave.

Oil (or Life).—(*a*) Fat; (*b*) rich in oil; (*c*) oily; (*d*) lean or low in oil; and (*e*) lifeless or dead.

Wax.—(*a*) Waxy, and (*b*) free of wax.

Solidity.—(*a*) Hard or woody; (*b*) compact; (*c*) firm; (*d*) flabby; and (*e*) flimsy.

Body.—(*a*) Thick or heavy; (*b*) fleshy; (*c*) medium body; (*d*) thin; and (*e*) tissuey.

Strength (Tensile).—(*a*) Tough; (*b*) strong; (*c*) normal strength; (*d*) weak; (*e*) tender.

Elasticity.—(*a*) Elastic; (*b*) semi-elastic; (*c*) stretchy; and (*d*) non-elastic.

Fibre Size.—(*a*) Fine fibres; (*b*) small fibres; (*c*) medium fibres; (*d*) large fibres; and (*e*) coarse fibres.

Venation.—Expressed as the number of degrees in the average angle between the main fibres (veins) and the midrib.

Width.—(*a*) Broad; (*b*) spready; (*c*) normal width; (*d*) narrow; and (*e*) stringy.

Length.—When length is not of sufficient importance to be treated as a separate factor, it is treated as an element of quality.

Shape of Tip.—(*a*) Round; (*b*) oblate or normal tip; and (*c*) sharp or pointed.

Grading.

The foregoing is designed to give some indication of what constitutes quality in flue cured tobacco and to stress the fact that ripeness of leaf at harvest is the first essential thereof.

As the smoking qualities of aroma, burn, and ash from present Queensland producing districts are accepted as satisfactory by manufacturers provided the leaf was sufficiently ripe when picked, their offers of purchase are consequently based on the visible characteristics of size, colour, texture, injury, and damage. Leaf in which quality is uniform neatly tied into medium-sized hands provides an attraction to the buyer, and invariably results in a more profitable return than would be the case if colours were mixed, quality varied, lengths too uneven, and hands roughly tied.

Standard Grades.—In a systematic classification of leaf it would first be divided into groups suggestive of body or thickness with attendant quality and its use in manufacture. Each group would then be divided into colours and further separated into a number of qualities dependent on leaf characteristics and injury or damage, if any.

With some experience the grower could more or less easily separate his leaf into groups and colours, but would meet difficulty in accurately grading into definite qualities.

A standard of grades would suggest a corresponding scale of prices as a desirable concomitant. Needless to state such a combination would require a degree of accuracy in classification hardly possible on the average farm.

A leaf warehouse, preferably on co-operative lines, with a trained staff to determine quality and to further classify when necessary, could be calculated to economically overcome defects in home grading. Such an organisation, provided standard grades and prices were adopted, would naturally become a selling agency through which possibly advances on leaf could be secured and growers' requirements supplied at minimum cost. It would suggest control of the industry by growers and the practicability of co-operative manufacture to counter any understanding among buyers to control prices.

A further advantage and one which would favour the monetary return to the grower would be the buyers' knowledge that leaf from such a leaf warehouse would be dependable not only in accuracy of classification but in storage condition.

At the present time much of the leaf received at factories has to be carefully examined as to grade and to be reconditioned for storage. The expense of this being obviated, would probably allow an advance in price equivalent to the charges of the leaf warehouse in that respect.

Standard grades have been established for many types of tobacco in the United States of America, and are utilised in the activities of the tobacco-grading service maintained by the Bureau of Agricultural Economics in co-operation with State Departments of Agriculture or similar administrative units there.

The function of the tobacco-grading service in so far as the auction markets are concerned is to inspect the tobacco delivered by farmers and label it according to its grade before the sale takes place. The grade is announced to the buyers, so that they as well as the growers are apprised of the grade and quality of the tobacco according to United States standards. As a part of this service the sales of graded tobacco are analysed, and reports are issued daily that show the average prices paid for each grade. By furnishing the grower information on the grade of his tobacco and the average selling price he is enabled to judge intelligently whether the price is reasonable and whether he should accept the sale. It is found at times the mere announcement of the official grade of given lots of tobacco enhances the prices paid to the growers.[4] The standard grades for flue-cured tobacco formulated by the United States Department of Agriculture,[5] to which pleasurable acknowledgment is given for assitance in defining the elements of quality, &c., provides for divisions as follows: —

Groups.	*Qualities.*	*Colours.*
A—Wrappers	1—First quality	L—Light or lemon
B—Leaf	2—Second quality	F—Medium or orange
C—Cutters	3—Third quality	R—Red or mahogany
X—Lugs	4—Fourth quality	D—Dark red or walnut
N—Nondescript	5—Fifth quality	G—Green or green mixed
S—Scrap	6—Sixth quality	

The adopted order of grade marks is as follows:—Group factor first, quality factor second, and colour factor third. Thus wrapper leaf would be given the factor A for the group, the second factor would refer to the quality (as first, second, or third), while the third factor would refer to its colour. In this manner A 1 L would represent wrappers of first quality in lemon colour, B 3 R would represent leaf of third quality in red or mahogany colour, and so on.

Provision is made for special factor symbols to form subgrades by placing a particular letter signifying same after or above the standard grade symbol. These, of course, would rarely be applied to properly graded leaf unless to qualify smoking leaf or primings.

Group Definitions.

Wrappers.—Any leaf which is clean, sound, smooth, elastic, oily, ripe, firm, and strong, and which has a bright finish, small to medium-sized and blending fibres, normal width, and not more than 5 per cent.

injury. In the wrapper grades a minimum length or size may be specified and a tolerance provided for leaves other than wrappers.

Leaf.—Tobacco which is medium to thick in body as compared with the average body of the type (in case leaf from different parts of the State is so determined) and which does not have the characteristics of lugs. Leaf is frequently referred to as heavy leaf, fillers, or tips.

Cutters.—Tobacco which is very thin to medium in body as compared with the average body of the type and which has the characteristics of lugs except with respect to injury and finish. Cutters are frequently referred to as thin leaf.

Lugs.—Any lot of tobacco, except nondescript and scrap, composed chiefly of comparatively thin and lean leaves, and showing a material amount of injury of the kind characteristic of leaves grown near the ground; or any tobacco, except nondescript and scrap, injured or containing lug leaves in excess of the tolerance allowed in the grades of the B and C groups. Lugs are ordinarily composed of leaves from near the bottom of the plant, and they are normally characterised by a dull or dingy finish.

Nondescript.—Any nested tobacco, or muddy or extremely dirty tobacco, or tobacco containing an unusual amount of foreign matter, or crude tobacco (very immature), or tobacco damaged to the extent of 20 per cent. or more, or tobacco infested with live tobacco beetles or other injurious insects, or wet tobacco, or incompletely cured tobacco, including fat stems and wet-butts, or very inferior lots of tobacco of the quality that is not ordinarily marketed, or tobacco having characteristics distinctly foreign to tobacco of other groups of the type.

Scrap.—A by-product from handling tobacco in both the unstemmed and stemmed forms, consisting of loose and tangled portions of tobacco leaves, except stems, which accumulate in warehouses, packing and conditioning plants, and stemmeries.

Smoking Leaf.—The thin side or characteristic of leaf grades having prominent fibres (bony leaf) and characterised by being non-elastic, low in oil, mellow, very grainy, porous, and showing a considerable amount of injury of the kind normally found in very grainy or overripe tobacco. Smoking leaf is determined a subgroup and designated by the letter "H" placed after or above the standard grade symbols.

Primings.—Any lugs composed of very thin, pale, silky, and premature leaves very low in oil and wax and of a dull and dingy finish. Priming lugs are the extreme opposite of grainy or overripe lugs. Primings should not be confused with the method of harvesting known as priming. Primings are treated as a subgroup and designated by the letter "P."

Qualities and Colours in each Group.—All qualities and colours shown in the divisions previously mentioned do not appear in each group of the American standards.

Wrappers are divided into three qualities and three colours only—namely, first, second, and third qualities in lemon, orange, or mahogany. Lower qualities and deeper colours than third quality in mahogany would be included in leaf or lugs according to body or thickness.

The *Leaf* group comprises six qualities in each of the lemon, orange, and mahogany colours. Neither first nor second qualities are considered when the colour is dark or green. In each of these colours the grades are, respectively, third, fourth, fifth, or sixth.

The *Cutter* group comprises first, second, third fourth, and fifth qualities in two colours only—lemon and orange. Deeper colours would be classed in the Lug group as well as a quality lower than fifth.

The *Lug* group comprises first second, third, fourth, and fifth qualities in lemon, orange, and mahogany only. There is no provision for dark colours, while green colour is placed in third, fourth, or fifth quality.

Nondescript and *Scrap* are not graded.

Uniformity.—The first essential in grading is to sort the leaves into lots of like group possessing similar qualities and colour. Values will be influenced by the degree of uniformity showing the percentage of a lot that may be of a distinctly different group, quality, or colour from the run of the lot. Such degree may be expressed as (*a*) uniform (less than 5 per cent.); (*b*) harmonising (less than 10 per cent.); (*c*) unmingled (less than 20 per cent.); (*d*) mingled or unmixed (less than 30 per cent.; and (*e*) mixed (over 30 per cent.). In American standard grades provision is made for subgrades. As explained previously under "Smoking Leaf" and "Primings," the letters "H" and "P," respectively, are applied to or in place of the group symbol.

Other special factor symbols are used after or above the grade marks to form other subgrades:—

K. *Off Colour.*—Tobacco of which 20 per cent. or more of its leaf surface has a grey, mottled, bleached, or foreign colour which does not blend with the normal colours of the type; or tobacco which does not blend reasonably well in its proper grade on account of some peculiar characteristic.

M. *Mixed.*—A lot of tobacco of which 30 per cent or more of its leaves are of a *distinctly different* quality and/or colour from the run of the lot and which contains less than 20 per cent. green.

T *Tips.*—Self-explanatory.

V. *Greenish Tinge.*—Tobacco of which 20 per cent. or more of its leaf surface has a decided greenish cast; or tobacco which is not 20 per cent. green but which has 20 per cent. of green and greenish cast combined.

L. *Light Green.*—Qualifying a green grade.

D. *Dark Green.*—Qualifying a green grade. Green tobacco is so classed if 20 per cent. or more of its leaf surface is predominantly green in colour.

U. *Unsound* or damaged, under 20 per cent.

W. Doubtful keeping order.

Arrangements of Grades.

The following American standard grades are arranged according to group and quality. General specifications are shown for each group. Opposite each grade symbol is a grade name or description and its specifications. The specifications and descriptions cover only the three grade factors—group, quality, and colour. A careful study should be made of definitions, elements of quality, before applying the specifications:—

WRAPPER GRADES (A GROUP).

General Specifications.—All grades of the A group must be clean, sound, ripe, firm, strong, and over 16 inches long, must have an open

weave, light to true colour shade, clear to bright finish, and small to medium size and blending fibres.

General Tolerance.—Five per cent. injury of a nature affecting wrapper yield.

U S Grade.	Grade, Description, Specification, and Tolerance.
A 1 L ..	Choice quality wrapper in Lemon colour. Very silky, very fine texture, very elastic, oily, thin to medium body, spready, uniform. Tolerance: 20 per cent. leaves of a quality not lower than B 2 or C 3.
A 1 F ..	Choice quality, wrapper in Orange colour. Very oily, medium to fleshy body; otherwise same as A 1 L.
A 1 R ..	Choice quality wrapper in Red or Mahogany colour. Rich in oil, fleshy to heavy body; otherwise same as A 1 L.
A 2 L ..	Fine quality wrapper in Lemon colour. Silky, fine texture, elastic, oily, thin to medium body, spready, uniform. Tolerance: 40 per cent. leaves of a quality not lower than B 2 or C 3.
A 2 F ..	Fine quality wrapper in Orange colour. Very oily, medium to fleshy body; otherwise same as A 2 L.
A 2 R ..	Fine quality wrapper in Red or Mahogany. Rich in oil, fleshy to heavy body; otherwise same as A 2 L.
A 3 L ..	Good quality wrapper picker in Lemon colour. Fairly silky, good texture, semi-elastic, oily, thin to medium body, normal width, fairly uniform. Tolerance: 60 per cent. leaves of a quality not lower than B 2 or C 3.
A 3 F ..	Good quality wrapper picker in Orange colour. Very oily, medium to fleshy body; otherwise same as A 3 L.
A 3 R ..	Good quality wrapper picker in Red or Mahogany colour. Rich in oil, fleshy to heavy body, otherwise same as A 3 L.

LEAF GRADES (B GROUP).

General Specifications.—All grades of the B group must be clean, sound, medium to heavy body, and must not exceed the tolerance specified with respect to injury and lugs.

U S Grade	Grade Description, Specification, and Tolerance
B 1 L ..	Choice quality leaf in Lemon colour. Very smooth, very good texture, stretchy, oily, ripe, firm, medium body, strong, normal width, open weave, light colour shade, bright finish, medium size and blending fibres, uniform. Tolerance: 5 per cent. injury.
B 1 F ..	Choice Quality leaf in Orange colour. Very oily, medium to fleshy body; otherwise same as B 1 L.
B 1 R ..	Choice quality leaf in Red or Mahogany colour. Rich in oil, fleshy body; otherwise same as B 1 L.
B 2 L ..	Fine quality leaf in Lemon colour. Smooth, good texture, stretchy, oily, ripe, firm, medium body, strong, normal width, open weave, fairly light colour shade, bright finish, emerging fibres, fairly uniform. Tolerance: 10 per cent. injury.
B 2 F ..	Fine quality leaf in Orange colour. Very oily, medium to fleshy body; otherwise same as B 2 L.
B 2 R ..	Fine quality leaf in Red or Mahogany colour. Rich in oil, fleshy body; otherwise same as B 2 L.
B 3 L ..	Good quality leaf in Lemon colour. Fairly smooth, fair texture, fairly oily, ripe, firm, medium body, fairly strong, normal width, true colour shade, clear finish, harmonising. Tolerance: 15 per cent. injury.

B 3 F .. Good quality leaf in Orange colour.
Oily, medium to fleshy body; otherwise same as B 3 L.

B 3 R .. Good quality leaf in Red or Mahogany colour.
Rich in oil, fleshy body; otherwise same as B 3 L.

B 3 D .. Good quality leaf in Dark Red or Walnut colour.
Rich in oil, heavy body; otherwise same as B 3 L.

B 3 G .. Good quality leaf in Green colour.
Quality of B 3 or better, except maturity.

B 4 L .. Fair quality leaf in Lemon colour.
Unrough, fairly ripe, medium body, normal strength, not stringy, fairly true colour shade, fairly clear finish, unmingled. Tolerance: 20 per cent. injury and 10 per cent. lugs of the quality of X 3 or better.

B 4 F .. Fair quality leaf in Orange colour.
Medium to fleshy body; otherwise same as B 4 L.

B 4 R Fair quality leaf in Red or Mahogany colour.
Fleshy body; otherwise same as B 4 L.

B 4 D .. Fair quality leaf in Dark Red or Walnut colour.
Heavy body; otherwise same as B 4 L.

B 4 G .. Fair Quality leaf in Green colour.
Quality of B 4, except maturity.

B 5 L .. Low quality leaf in Lemon colour.
Fairly ripe, medium body, dusky colour shade, dull finish, unmixed. Tolerance: 30 per cent. injury and 20 per cent. lugs of the quality of X 3 or better.

B 5 F .. Low quality leaf in Orange colour.
Medium to fleshy body, otherwise same as B 5 L.

B 5 R Low quality leaf in Red or Mahogany colour.
Fleshy body; otherwise same as B 5 L.

B 5 D .. Low quality leaf in Dark Red or Walnut colour.
Heavy body; otherwise same as B 5 L.

B 5 G . Low quality leaf in Green colour.
Quality of B 5, except maturity.

B 6 L Common quality leaf in Lemon colour.
Fairly ripe, medium body, dark colour shade, dingy finish. Tolerance: 40 per cent. injury and 30 per cent. lugs.

B 6 F .. Common quality leaf in Orange colour.
Medium to fleshy body; otherwise same as B 6 L.

B 6 R .. Common quality leaf in Red or Mahogany colour.
Fleshy body; otherwise same as B 6 L.

B 6 D . Common quality leaf in Dark Red or Walnut colour.
Heavy body; otherwise same as B 6 L.

B 6 G .. Common quality leaf in Green colour.
Quality of B 6, except maturity.

CUTTER GRADES (C GROUP).

General Specifications.—All grades of the C group must be clean, sound, thin to medium body, must have an open weave, and small to medium size fibres, and must not exceed the tolerance specified with respect to injury and lugs.

U S Grade Grade Description, Specification, and Tolerance.

C 1 L .. Choice quality cutters in Lemon colour.
Very silky, fine texture, oily, thoroughly ripe, firm, thin body, fairly strong, spready, light colour shade, bright finish, blending fibres, uniform. Tolerance: 5 per cent. injury.

C 1 F .. Choice quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 1 L.

C 2 L .. Fine quality cutters in Lemon colour.
Silky, very good texture, oily, thoroughly ripe, firm, thin body, fairly strong, fairly spready, light colour shade, very clear finish, blending fibres, fairly uniform. Tolerance: 10 per cent. injury.

C 2 F .. Fine quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 2 L.

C 3 L .. Good quality cutters in Lemon colour.
Very smooth, good texture, fairly oily, ripe, fairly firm, thin body, normal strength, normal width, fairly light colour shade, clear finish, emerging fibres, harmonising. Tolerance: 15 per cent. injury and 10 per cent. lugs of the quality of X 2 or better.

C 3 F .. Good quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 3 L.

C 4 L .. Fair quality cutters in Lemon colour.
Smooth, fair texture, lean, ripe, thin body, normal strength, normal width, true colour shade, normal finish, unmingled. Tolerance: 20 per cent. injury and 20 per cent. lugs of the quality of X 2 or better.

C 4 F .. Fair quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 4 L.

C 5 L .. Low quality cutters in Lemon colour.
Fairly smooth, lean, fairly ripe, thin body, not tender, normal width, fairly true colour shade, normal to dull finish, unmixed. Tolerance: 20 per cent. injury and 30 per cent. lugs of a quality of X 3 or better.

C 5 F .. Low quality cutters in Orange colour.
Fairly thin to medium body; otherwise same as C 5 L.

LUG GRADES (X GROUP).

General Specifications.—All grades of the X group must be clean, sound, and must not exceed the tolerance specified with respect to dead and trashy leaves.

U S Grade — Grade Description, Specification, and Tolerance.

X 1 L Choice quality cutting lugs in Lemon colour.
Smooth, fairly oily, thoroughly ripe, thin to medium body, grainy, very open weave, true colour shade, fairly clear finish, fairly uniform. Tolerance: 5 per cent. of dead and trashy leaves.

X 1 F .. Choice quality cutting lugs in Orange colour.
Medium body; otherwise same as X 1 L.

X 1 R .. Choice quality leafy lugs in Red or Mahogany colour.
Oily, medium to heavy body; otherwise same as X 1 L.

X 2 L . Fine quality cutting lugs in Lemon colour.
Fairly smooth, thoroughly ripe, thin to medium body, fairly grainy, open weave, fairly true colour shade, normal finish, unmingled. Tolerance: 10 per cent. of dead and trashy leaves.

X 2 F .. Fine quality cutting lugs in Orange colour.
Medium body; otherwise same as X 2 L.

X 2 R .. Fine quality leafy lugs in Red or Mahogany colour.
Oily, medium to heavy body; otherwise same as X 2 L.

X 3 L .. Good quality cutting or granulating lugs in Lemon colour.
Unrough, ripe, thin to medium body, fairly grainy, fairly open weave, fairly dusky colour shade, dull finish, unmixed. Tolerance: 20 per cent. of dead and trashy leaves.

X 3 F .. Good quality cutting or granulating lugs in Orange colour.
Medium body; otherwise same X 3 L.

X 3 R .. Good quality leafy lugs in Red or Mahogany colour.
Fairly oily, medium to heavy body; otherwise same as X 3 L.

X 3 G .. Good quality lugs in Green colour.
Quality of X 3, except maturity.

X 4 L .. Fair quality granulating lugs in Lemon colour.
Fairly ripe, thin to medium body, dusky colour shade, cloudy finish. Tolerance: 40 per cent. dead and trashy leaves.

X 4 F .. Fair quality granulating lugs in Orange colour.
Medium body; otherwise same as X 4 L.

X 4 R .. Fair quality leafy lugs in Red or Mahogany colour.
Medium to heavy body, otherwise same as X 4 L.

X 4 G Fair quality granulating lugs in Green colour.
Quality of X 4, except maturity.

X 5 L .. Common quality granulating lugs in Lemon colour.
Thin to medium body, dark colour shade, dingy finish. Tolerance: 60 per cent. dead and trashy leaves.

X 5 F . Common quality granulating lugs in Orange colour.
Medium body; otherwise same as X 5 L.

X 5 R .. Common quality leafy lugs in Red or Mahogany colour.
Medium to heavy body; otherwise same as X 5 L.

X 5 G Common quality lugs in Green colour.
Quality of X 5, except maturity.

NONDESCRIPT AND SCRAP (N. AND S. GROUPS).

N. *Nondescript,* as defined.

S. *Scrap* as defined.

A careful study of the specifications of the United States standard grades for flue-cured tobacco is calculated to prove most informative to the Queensland grower, as will also the elements of quality involved therein.

It will be noted in each case colour deepens with increase of body; also, the quality of such colour in the degree of finish is influenced by departure from full ripeness and the efficiency of harvest, cure, and bulking.

Throughout this article the necessity for full ripeness at harvest is stressed Attention is also drawn to the depreciation of the product that is liable to occur from careless handling (bruising and breakage) in the various stages from picking to arrival on the selling floor, as well as to faults in curing.

It should be understood the grade marks in America are not placed on the tobacco by the grower, but by the officials of the United States grading service after careful examination of the lots prior to their offer for sale, usually by auction.

Should a standard of grades be adopted for Queensland or Australia the marking of such grades would no doubt be effected by a grading service similar to that of the United States of America.

Home Grading.

Whether a standard of grades was adopted or not, the grading of leaf on the farm would be necessary for economic production. At all times the grading of leaf on the farm has been advocated by the Queensland Department of Agriculture, since not only does it result in a lessened cost of production but tends to improve the growers' knowledge

of leaf quality and indicate directions for improvement. Those growers who have classified their leaf and marketed it direct have found it decidedly profitable and in most instances have received approval from buyers. Many have stated their average price for home graded was appreciably in advance of that received when the leaf was sent to a proprietary grading concern, and that the amount of scrap or damaged leaf was much less.

A deterrent to home grading in most instances is lack of confidence on the growers' part and the idea that the time occupied therein cannot be spared from other farm operations. By adopting a system in bulking down after each cure, grading will be much simplified and the time occupied therein greatly lessened.

As remarked previously, leaves ordinarily increase in body from the bottom to the middle of the plant, and decrease from there to the top. When the stand of plants is even in growth to maturity each picking will be of leaves occupying practically the same position on the respective plants. They will thus be of more or less even size and texture, differing slightly in quality and colour. In other words they will agree with one or other group.

It has been recommended to bulk down each cure on the sticks on removal from the curing barn (*see* under "Conditioning" in "Tobacco Growing in Queensland"). This will, of course, necessitate a double lot of sticks to allow of the barn being immediately filled again. On the sticks the leaf will come into more even condition, and allow greater ease of handling. During the following cure ample time will be available to take the leaf from the sticks and to roughly grade it into, say, three grades, such as Bright, Medium Bright, and Green (if any). At the same time leaf of another group which on some plants may have been ripe at the time could be separated and added to its proper bulk Bulks can thus be built up representing the respective pickings from all the plants in the crop. Each would then very largely conform to one of the groups as Lugs, Wrappers, Leaf, or Cutters.

When attention was given to grading for market each bulk would yield leaf in which size, body, texture, and quality as well as colour would be fairly uniform. The number of grades from a bulk would therefore be confined to three or four, or at most five, according to colour and injury rather than to difference in group or quality. Where. as is frequently the case, pickings from all parts of the plants are included in one or two bulks difficulty is experienced, as leaves differing in body, size, quality, and colour are encountered, necessitating upward of a dozen receptacles for the different grades. It is obvious that the leaf in systematic bulking will be graded with much greater speed and accuracy.

It must not be supposed that leaf of each group will be found in quantity in every crop. Soils and seasons as well as the cultural methods employed, influence quality in tobacco.

Any standard of grades must necessarily provide a large number to allow accurate classification of leaf from crops grown on light to heavy soils and in favourable to unfavourable seasons.

The number of grades to be found in any one crop will be comparatively few in any season, though their quality will be accordingly varied.

In home grading, where the soil on which the crop is grown is fairly uniform, the average pick of three ripe leaves will conform to the requirements of one or other of the grades mentioned, when size of leaf and amount of body are considered.

Colour.—It will be noted in the instructions for grading in "Tobacco Growing in Queensland" that colours are described as Lemon, Bright Mahogany, Mahogany, Dark, and Green. In the American standard Orange is used in place of Bright Mahogany.

At the present time when leaf is offered for sale either on the farm or on an auctioneer's selling floor, buyers insist that it shall be graded into hands and packed ready for transport. The packages are opened and two or more hands extracted. The quality of these hands on examination decides the offer.

As the package bears the grower's name and district as well as its weight and a distinguishing number, it is identifiable at the factory with the buyer's returns. When unpacked there for reconditioning or manufacture the accuracy of grading and the agreement or otherwise of quality of sample to bulk is noted. Such information is no doubt passed on to the buyer who is accordingly guided in his offers of purchase on the next occasion. The grower will thus become known as dependable or otherwise in his grading. A reputation for care in grading can be calculated to influence a possible improvement in offers of purchase just as one for carelessness would suggest a decline.

As mentioned previously, where the soil of the tobacco field is more or less uniform the grading of leaf therefrom will not present much difficulty, especially when systematically bulked.

Size of leaf, body, and texture will largely agree in each bulk, allowing attention to be mainly directed to assortment according to colour, blemish, and injury.

The accidental inclusion in the bulk of leaf of another group will be at once seen, while a definite change of body will be noticed when handling. Such leaves will be few in number and can be set aside for later attention. Leaves with broken stems or midrib should not be included with whole leaf but classed as scrap. As labour during manufacture is increased in the operation of stemming, their inclusion will invariably result in the lowering of offers of purchase.

A well lighted room is absolutely necessary to permit of satisfactory grading as well as a good sense of colour on the part of the assorter.

The atmosphere in this room should carry a degree of humidity sufficient to disallow the drying of leaf during grading and handing. A dry atmosphere, such as obtains when westerly winds prevail, can be corrected by damping the floor or suspending wet bags in positions where contact with the tobacco is not possible.

When the leaf in the bulk is so dry that it cannot be properly examined without danger of breakage it will be necessary to bring it into sufficient condition to permit of ready handling.

A room in which humidity can be controlled fitted with racks to carry shallow trays with wire-netted bottoms to hold leaf so that the humidified air will readily circulate through it, is of great advantage in so doing. By a gradual absorption of moisture in this manner a satisfactory condition is most easily secured.

A more expeditious though less attractive method is to admit steam at a very low pressure to the bottom of a box or similar receptacle at least 2 feet in height, the bottom, sides, and ends of which are close-boarded and the top covered with wire-netting. The leaf is placed on this and carefully separated so that contact is made with the vapour arising until it becomes sufficiently limp. Care is necessary with this method to prevent over conditioning by which colour would be depreciated.

Sizing.—The size of a leaf is denoted by its length and breadth. Varieties differ in the relation of one to the other, but not to a remarkable extent in those at present commonly grown in the State for flue-curing. As the leaf grown on the farm will usually be the product of one variety length can be taken to determine size.

In such leaf the qualities of flatness, texture, smoothness, porosity, solidity, body, strength, elasticity, &c., will generally agree with the lengths, except in the case of primings or sand lugs, where departures therefrom are pronounced.

Where more than one variety is grown and there is great disparity in the width of leaves of equal length separate grades are advisable.

Lengths.—Should a standard of grades be adopted for the State is is probable a standard of tobacco sizes therewith would also be determined. Until such, however, has been consummated, the following sizes, with a range of four inches between longest and shortest therein, are suggested:—

Under 8 inches (class as scrap)
8 inches to 12 inches
12 inches to 16 inches
16 inches to 20 inches
20 inches to 24 inches
24 inches to 28 inches
28 inches and over

The lengths given are approximate. A tolerance for leaves slightly under or over the lengths stated will no doubt be permitted. All the sizes are unlikely to be found in any one crop; they will usually be limited to three or four.

Body.—The body or thickness of the leaf discernible when handling will generally agree with the size. When it does not, as with primings or sand lugs, which are very thin, the difference is sufficiently pronounced to allow of easy separation.

Apart from primings a definite change in body according to size of leaf may be due to growth in a distinctly different type of soil from that general in the field, such as a small area where clay comes close to the surface. Leaf from diseased plants or those affected with nematodes will also vary in body as well as in quality.

Where such leaf is in insufficient quantity to form separate lots for market it can be included in the nearest grades, where a certain tolerance will be allowed. Usually, however, such leaf is of inferior quality to the run of the lot, and will find a place in the lower grades.

Colour.—The colour of leaf, when the shade is light or true and the finish bright or clear, is regarded as a special quality in manu-

facture. Otherwise it is an indication of quality as regards maturity and the efficiency of cure.

As body usually agrees with size, in which many of the elements of quality concur, the value of classification according to colour will be realised.

Injury.—The amount should be calculated as the percentage of the leaf thereby depreciated. Breakage of leaf, otherwise uninjured, does not necessarily lower its smoking quality. A slight fracture of the leaf blade without loss can be disregarded. Broken stems, however, are definitely regarded as injury, as they increase the cost of manufacture. Allow 5 per cent. of injury for each break. Injury, otherwise, will be calculated as the approximate percentage of the usable part of the leaf which is lost or depreciated in value through various agencies—see definition of injury or damage.

Grades are suggested showing, respectively, 5 per cent., 10 per cent., 20 per cent., 30 per cent., 40 per cent., and over 40 per cent.

Wholly dead and trashy leaves which cannot be conditioned should be discarded.

[TO BE CONTINUED.]

TO MEND TANKS AND TROUGHS.

Miss Barbara McGovern, of Waterloo, Longreach, supplies this practical hint:—To mend tanks or troughs that have pinholes rusted through, fill a kerosene tin with cold water. Throw in washing soda until the saturation point is exceeded and undissolved soda can be seen lying on the bottom of the tin. Next get a flat vessel, such as an old baking dish, and mix cement with this water until it becomes a thick paste (make only a small quantity of cement at a time, as it sets very quickly). Apply this paste thickly to the holes with a brush, spreading some around them also. Moisten and wring out a piece of strong unbleached calico and press it down on the cement firmly and smoothly, as if sticking paper on a wall. Put another coat of cement paste on this, then apply another strip of calico, and a final coat of cement will finish the job. Two people are needed to make it a success—one to mix the plaster, and one to do the work. The man mixing the cement must keep briskly stirring and mixing the paste, turning it over with a small trowel till all is used. Water should be shut off the tank for twelve hours. The patch will then have set hard and will not crack when the tank expands or peel off when dry. Sheep troughs stand for years after this treatment, and a tank made of flat galvanised iron was successfully treated while full of water. No soda was available on one selection, and waterglass was used to mix the cement, and used while the tank was full of water. During this present drought the scarcity of water is a very serious matter, and all old tanks, carbide drums, or anything that will hold water is called into commission, and a job has to be done in a hurry, with no plumber available. Selectors on the Thompson River are carting water for household and stock use for many miles, and as the water is rapidly disappearing, it has to be stored as much as possoble.

The Pig Farm.

ACCOMMODATION AND EQUIPMENT.

(*Revised.*)

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

IN providing accommodation for his pigs, the farmer must consider the health and comfort of his stock and plan to prevent disease as far as practicable; he must also consider his system of feeding and management and bear in mind the class of pigs that is required by the pork and bacon trades.

During recent years the general demand has changed towards leaner meat, and pig-raisers are now endeavouring to produce pork and bacon pigs which have an abundance of lean meat and a minimum of fat; this, of course, necessitates a change of methods in breeding, feeding, and management.

Investigations into disease in pigs have shown that certain rules in sanitation regarding pig accommodation will, if carried out, control most of the serious troubles which occur in pigs, particularly infestation by internal parasites.

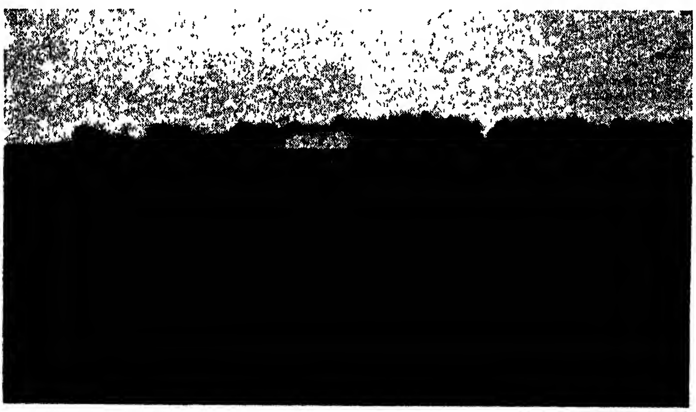


PLATE 188.

Berkshire sows being kept economically on lucerne. Their movable shelter shed may be seen in the background.

Although certain features must be considered for the pig's health and comfort, one must also consider the cost of providing pig accommodation, for pig-raising is a business, and if too much capital is expended on the insurance of health of the stock, the additional income may not give sufficient return on the capital invested. Fortunately, under the mild climatic conditions which prevail in Queensland, ample accommodation may be provided for pigs at a comparatively low cost and the outlay on good piggery equipment is usually well repaid.

The class of accommodation required for any piggery depends upon the system of pig-raising to be carried out. There are several fairly well-defined systems in Queensland. The coastal dairy farmer who keeps pigs to utilise separated milk usually has very little cultivation and rarely grows grain, depending on the separated milk, perhaps some sweet

potatoes and arrowroot, together with some pasture, to feed his pigs. Under these conditions the pigs are usually kept fairly convenient to the dairy to reduce the labour required in conveying milk to the pigs, and, if practicable, the pigs are fed at a place lower than the dairy, the milk being conveyed from the separator room to the piggery by means of an open gutter pipe. On this class of farm pigs are usually given access to grazing on permanent pastures.

The mixed farmer who combines dairying with crop-growing keeps pigs to use his milk by-products and a portion of his grain, root crops, lucerne, and pumpkins. He studies the market prices of pigs and of the various crops to determine when to market his crops direct and when to sell them by way of the pigs. Under these conditions more pigs are kept per cow than where milk is the main source of food supply. The pig accommodation on this type of farm should be such that the pigs can be turned on to portions of the cultivation land to enable them to harvest some of their own food when desired.

Pig-raisers who do not use milk, but substitute meat meal in the pig's ration and grow grain, lucerne, and other crops especially for pigs, have a different proposition again and should aim at having all their paddocks suitable for holding pigs.

PLATE 189.
These prime baconers were "finished" under paddock conditions, never having been penned.

Pig farmers who run large numbers of pigs on small areas of land adjacent to cities or towns or near dairy factories, and feed their pigs on table refuse or factory by-products, usually keep their pigs on a different system to farmers who have fairly large farms and produce most of their pig food.

Bearing in mind the most important feature of pig accommodation —namely, sanitation—there can be only two clearly-defined systems of keeping pigs which are completely satisfactory; one is the grazing system, wherein pigs are kept on fresh pasture or crop land which is

either rested or cultivated and grazed in rotation; the other is the intensive system in which the pigs are kept on impervious floors, such as concrete, which are properly drained and regularly cleansed. In both of these systems the object should be to keep the pigs on clean ground or on a clean floor, for a good deal of the infection to which pigs are subject lurks on the ground or floor of pig pens which are not rested or are inconvenient to cleanse.

Where there is a sufficient area of good grazing land or cultivation land the grazing system has many advantages, and should be adopted either entirely or in combination with the intensive system, which is often convenient for sows with young litters of pigs. If sufficient paddocks can be cropped for the pigs to do the harvesting, the paddocks being ploughed a couple of times each year, infection will be kept at a minimum, the pigs will receive benefit from the exercise gained in grazing or harvesting their own food, a good deal of labour is saved in the harvesting of the crop, and the fertility of the land benefits.

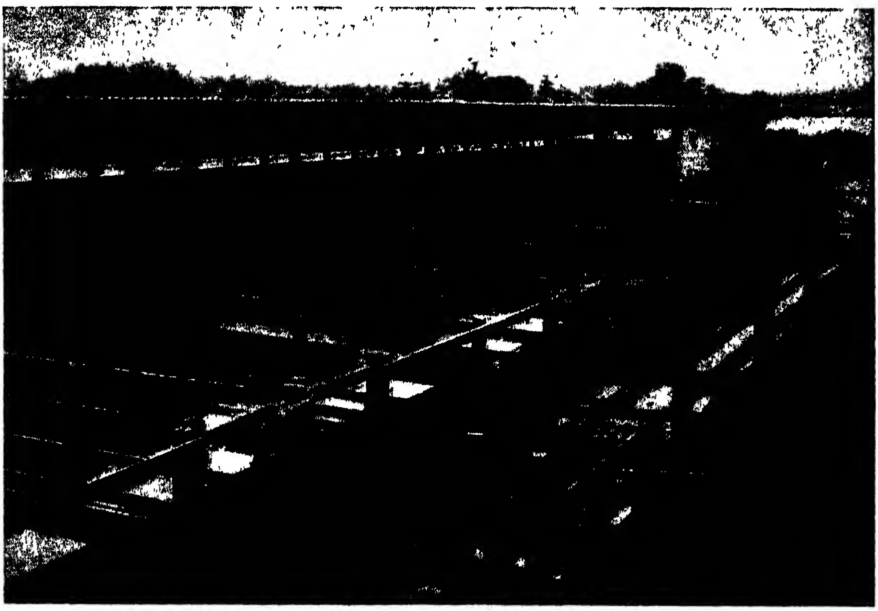


PLATE 190.

Intensive pig pens in use at the Animal Health Station, Yeerongpilly.

On grazing land where cultivation is not practicable it is necessary to have sufficient paddocks of ample area to keep them always well grassed and to enable the resting of the paddocks at frequent intervals. Pig paddocks should not be over-stocked so that they become bare, unless they can be cultivated or rested for several months. Even if pigs are paddocked as suggested, the ground near the troughs will become "pig sick" after a time, and it is most desirable that such equipment should be movable. Sheds of convenient size—say, with a floor space of 8 ft. square—should be provided in the paddocks to shelter the pigs from the extremes of the weather, and these sheds should be built on skids to allow of their easy transport about the paddock or from one

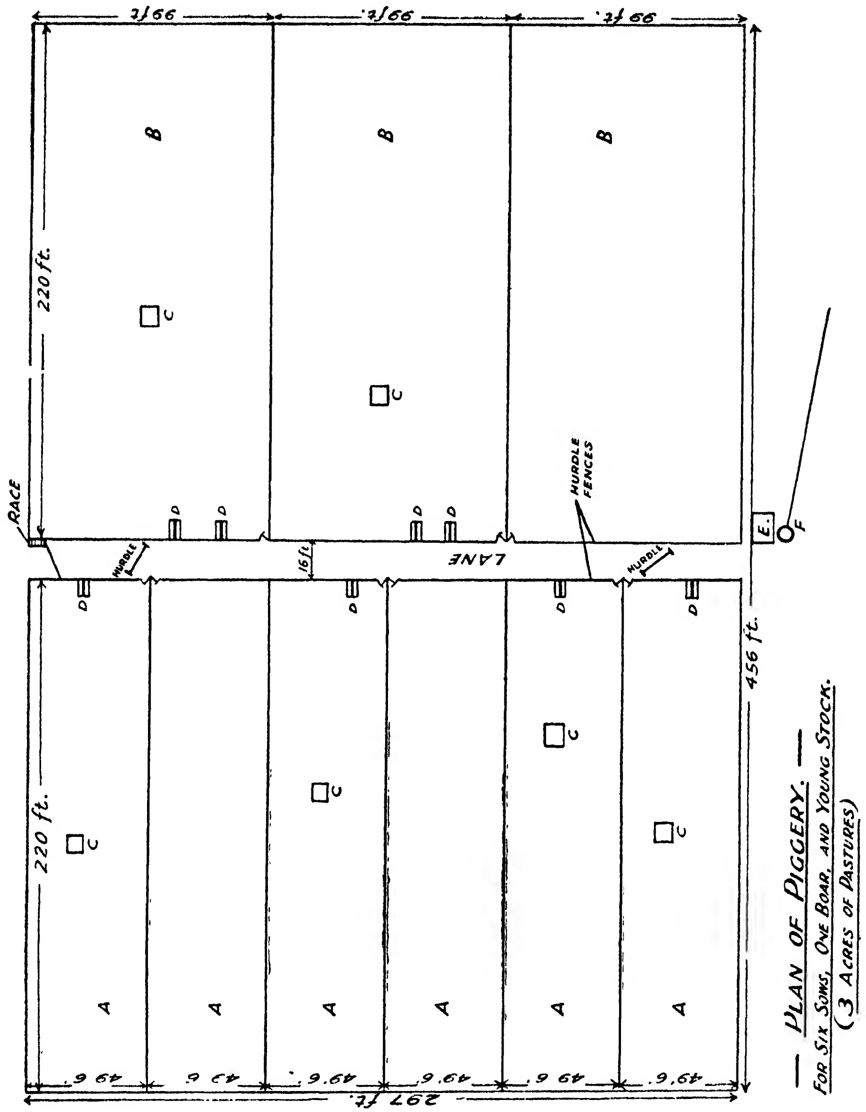


PLATE 191.

(*a*) Indicates paddocks of ¼ acre each for the use of dry sows, sows with litters, and the boar. At most times two of these paddocks could be under cultivation and later be grazed in rotation.

(*b*) Indicates paddocks of ½ acre each in extent to be used for growing pigs. As one paddock could usually be spared they can be cultivated and grazed in rotation.

Six movable sheds (*c*) should be sufficient shelter for the pigs, as these may be moved from one paddock to another as required.

Troughs built on movable platforms (*d*) will be found convenient if drawn against the fence and moved along as the surrounding ground becomes fouled.

(*e*) Shows the feed shed.

(*f*) Shows the milk tank connected by a line of fluming from the separator-room.

paddock to another. Food troughs and platforms, self-feeders, and water fountains should also be mounted on skids for easy transport.

With movable equipment and sufficient paddocks, there is no necessity for cleaning up with broom and shovel, and where pigs are kept on the grazing system the whole piggery is found to be free of noxious odours which are usually associated with small pen piggeries; these features make pig-raising a much more congenial undertaking when the grazing system is adopted.

When the intensive system of pig raising is adopted, impervious floors and good drains are essential; a good supply of water and labour is also required to clean the pens daily. Intensive pens are necessarily small, and a portion of each pen is roofed to provide the pigs with shelter from the extremes of the weather. (*See* plan of intensive pig pens.)

A Suggested Layout.

The plan of a piggery shown in Plate 191 suggests a layout which has proved very satisfactory where suitable cultivation or grazing land is available. This plan gives scope for cultivation and rotational grazing of paddocks with a view to providing a maximum of pasture for the pigs and control of disease and parasites. The lane in the centre of the runs with a loading race at one end and two movable hurdles provides ample facilities for drafting pigs.

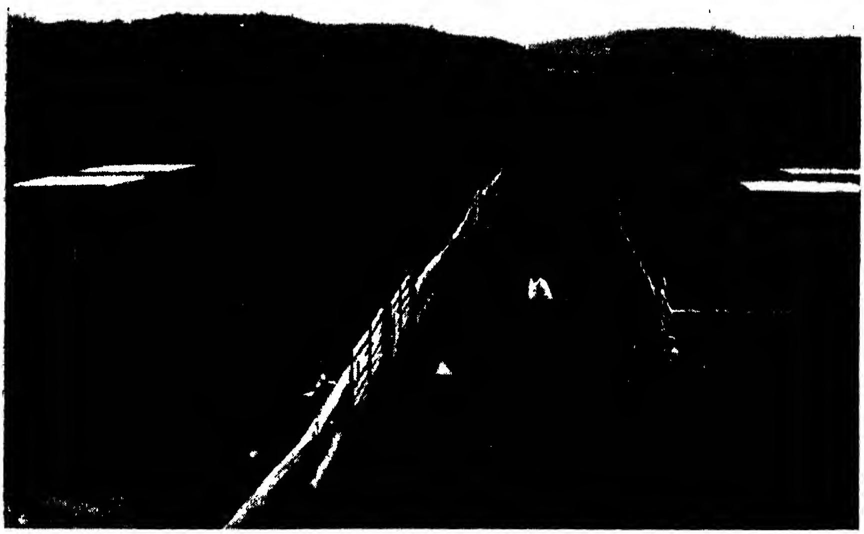


PLATE 192.

A section of a paddock piggery on Mr. W. F. Kajewski's property at Glencoe, showing the laneway, portions of paddocks, and movable shelter sheds. The long narrow paddocks are cropped regularly, and the system has been working satisfactorily for some years.

The usual fencing should be replaced by movable hurdles at the ends of the runs adjoining the lane, so that when paddocks are being cultivated implements may work right to the end of the run, for it is this portion around the troughs which becomes most fouled.

It is not suggested that the pigs will obtain all their food from the 3 acres of grazing shown in the plan, and the grazing can only be

expected to carry the pigs if other food, such as grain and milk or grain and meat meal, are provided in addition.

Where the correct type of pig is bred and feeding conditions are good, pigs may be kept in paddocks as suggested, from birth to slaughter, with excellent results.

On every farm where pigs are bred and reared a certain number of paddocks or pens are necessary so that pigs of various classes and ages may be kept separately. Breeding sows when dry should be run in a separate enclosure to other pigs, and in some cases it is even desirable to run the forward sows separate from the backward sows. Dry sows will secure the greatest part of their food requirement from good grazing and give best results when kept out in the open.

PLATE 193.

This litter of Middle Whites on Mr. H. O. Rees's farm, Maleny, appear to appreciate clean conditions.

The best results are obtained when sows with young litters are kept in individual enclosures, and as it is rather difficult on large piggeries to give each sow and litter a separate paddock large enough to be cultivated, the intensive pen is often resorted to for sows and young litters. However, the sows and litters may be kept separately on pasture by providing each one with a hut to which are affixed three hurdles, making a small run; the whole unit should be movable so that the pigs can be put on to fresh pasture as each patch becomes fouled.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3-in. by 2-in. hardwood, 1-in. water piping, or saplings. It should be placed 9 in. above the floor and 7 in. from the walls.

Individual care is most necessary for sows and litters until the youngsters are about three weeks old, and after that time several sows

with litters of approximately the same age may be run together with good results; however, no other pigs should be run with these. When the pigs are three or four weeks old they may be provided with a self-feeder containing grain or meals; the sows may also be given access to the self-feeder during this latter half of the lactation period, one feeder being sufficient for several sows and litters. When a feeder containing dry foods is provided, there should also be an accessible water supply, even if the pigs are given milk in addition. The young pigs do very well on this system of feeding, and when it is desired to wean them at eight weeks old the self-feeder should be enclosed with hurdles, which enable the young pigs to enter, but exclude the sows. The sow's food supply is so reduced that her milk flow ceases, and at the same time the young pigs take a larger amount of food from the trough, and thus weaning is achieved satisfactorily.

PLATE 194.

The system of pasturing sows and litters in movable huts with three hurdles attached to provide a yard is here illustrated in use at Mr. W. Dawson's farm, Woolooga.

After weaning the sows should be returned to the dry sows' paddock and the weaners should be graded into lots according to size.

From weaning time until marketing the growing pigs should be graded according to size into as many lots as convenient; under the grazing system, provided there is ample trough space to feed the pigs comfortably, two or three lots will be sufficient for the growing pigs; under the intensive system, pigs are usually kept in smaller lots.

Situation.

In selecting a site for intensive pig pens, consideration should be given to the aspect so as to provide shelter from the prevailing winds and to make the best use of the early morning sun as a disinfectant and deodoriser inside the sheds; thus a north-easterly aspect will usually be found the most suitable.

It is an advantage to have the pig paddocks on a slope to provide surface drainage. It is required by the Dairy Produce Act that the piggery should be situated at least 150 ft. from dairy yards and buildings.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

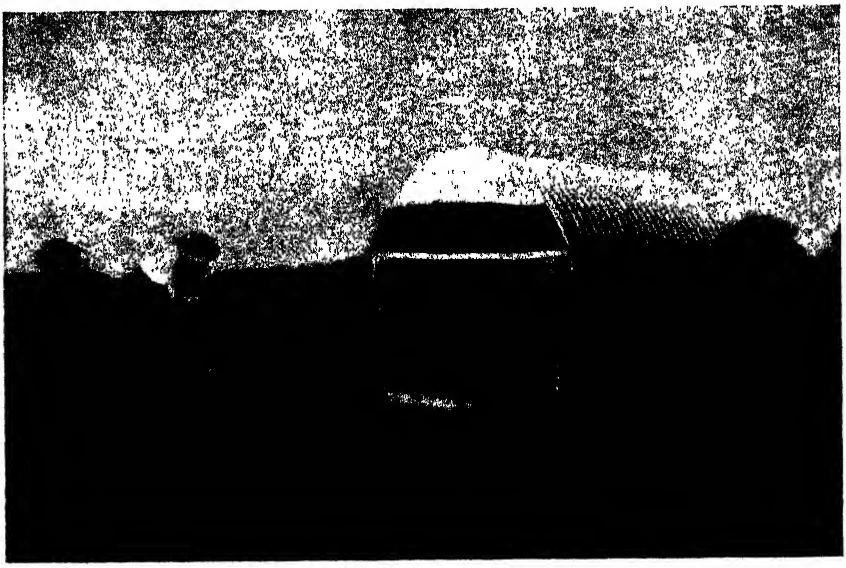


PLATE 195.

A half-tank movable shed in use at the St. Lucia Training Farm.

Legislation.

Pig-raising is controlled by legislation under the Pig Industry Act, Dairy Produce Act, Diseases in Stock Act, and the Slaughtering Act, and the by-laws of city, municipal, and shire councils. While it is advisable, when about to construct or alter a piggery to consult the authorities concerned, through the district inspectors under the Acts, it might be stated here that the general purposes of the legislation in force are to provide for health and sanitation on the premises where pigs are kept. They do not aim at hindering progress or at increasing the cost of production.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against disease.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time. An average space of 10 in. should be allowed for each adult pig. The trough should have the capacity to hold a full feed for the pigs.

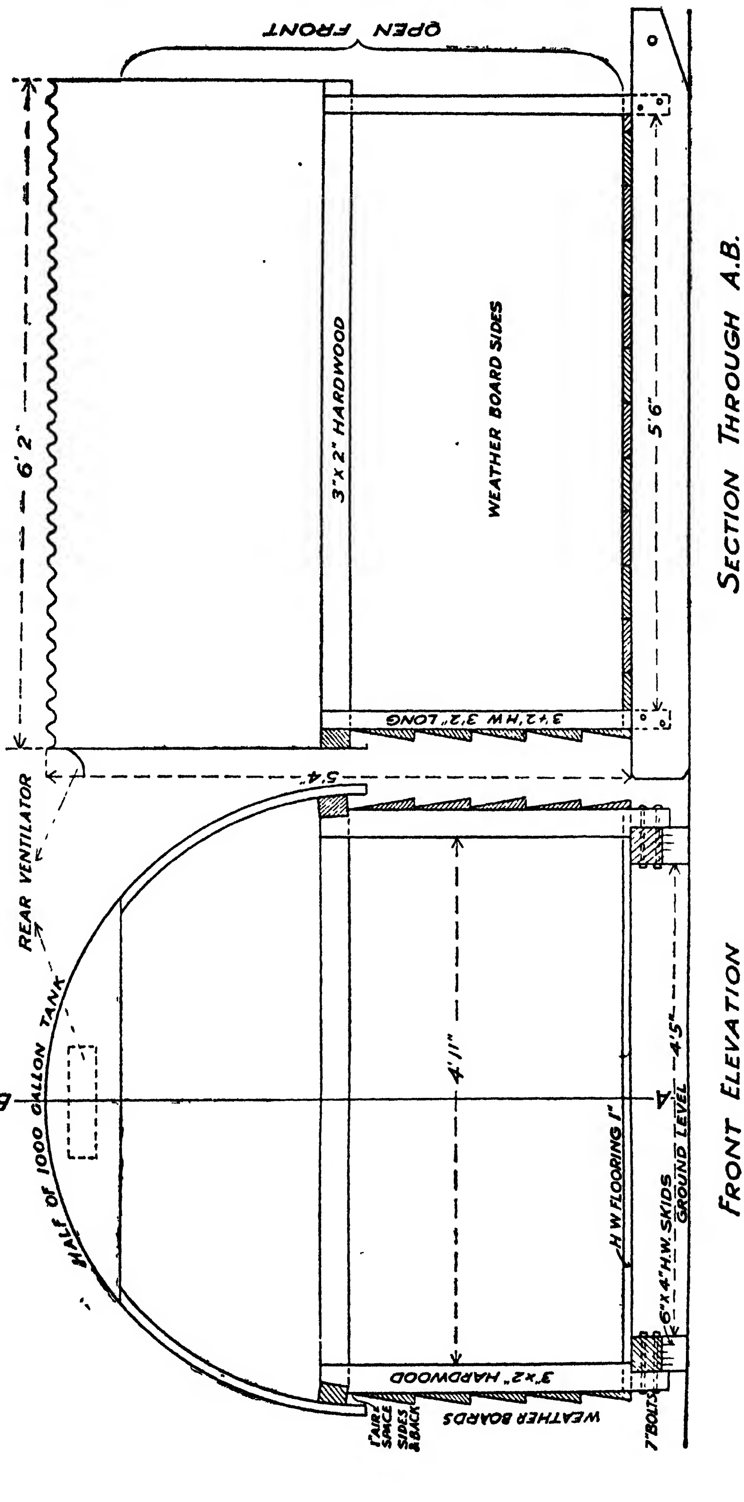


Plate 196.

Plan of a portable shelter shed, using half a water tank Note skids on which this shed is constructed, providing for ready means of moving the house when required.

PLATE 197.

The fence illustrated consists of "pig netting" of eight horizontals, 30 inches high in all. In addition, a barbed wire has been provided on the ground to prevent rooting, and another 6 inches above the netting to prevent jumping.

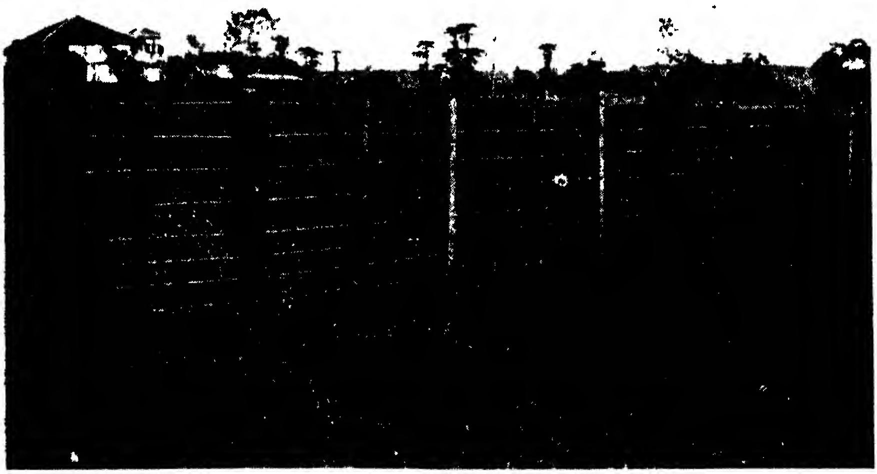


PLATE 198.

This fence at the Kairi State Farm has posts 10 feet apart, with four wooden droppers to a panel; seven plain wires run through the posts, and a barbed wire at the bottom prevents pigs rooting below the fence. If it is kept well strained, this type of fence is useful for all but very small pigs, and is cattle-proof.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made, they should be of a size which allows of their being easily carried or hauled on to clean ground. With stationary troughs it is essential that they should be built on to a floor of concrete, brick, or timber to prevent the pigs from making an objectionable mud wallow beside the trough. The most serviceable troughs are of concrete, built into a concrete floor, as shown in Plate 200.

PLATE 199.

Where palings are readily available they can be used for pig fencing, as shown in this illustration.

The V-shaped wooden trough as illustrated in Plate 201 is very useful as a movable trough. This type of trough can be made of varying sizes to suit requirements. The timber must be tightly fitted to prevent leakages. A dressing of tar inside and out acts as a preservative of the wood and also makes it water-tight and more hygienic. Such a trough built on a movable wooden platform is very convenient for paddock use.

Automatic Waterer.

Plate 202 illustrates a watering device used at the Kairi State Farm piggery. A 40-gallon drum is set into a trough 6 in. deep, and the whole is fixed on to a slide. The drum has a $\frac{3}{4}$-in. plug hole $1\frac{1}{2}$ in. from its bottom, and a larger plug hole for filling at its top. The lower hole allows the water to flow out to a sufficient height to allow of the pigs drinking from the trough; and to fill the drum, the bottom hole is plugged and the top hole opened.

Self-feeding of pigs is as yet little practised in Australia, because pigs are kept chiefly to utilise by-products, such as separated milk, which are not readily adaptable to self-feeding; but when the price ratio of grain and pork is such as to make the pig a profitable means of disposing of grain, pig-raising must be considered from a somewhat different view-point.

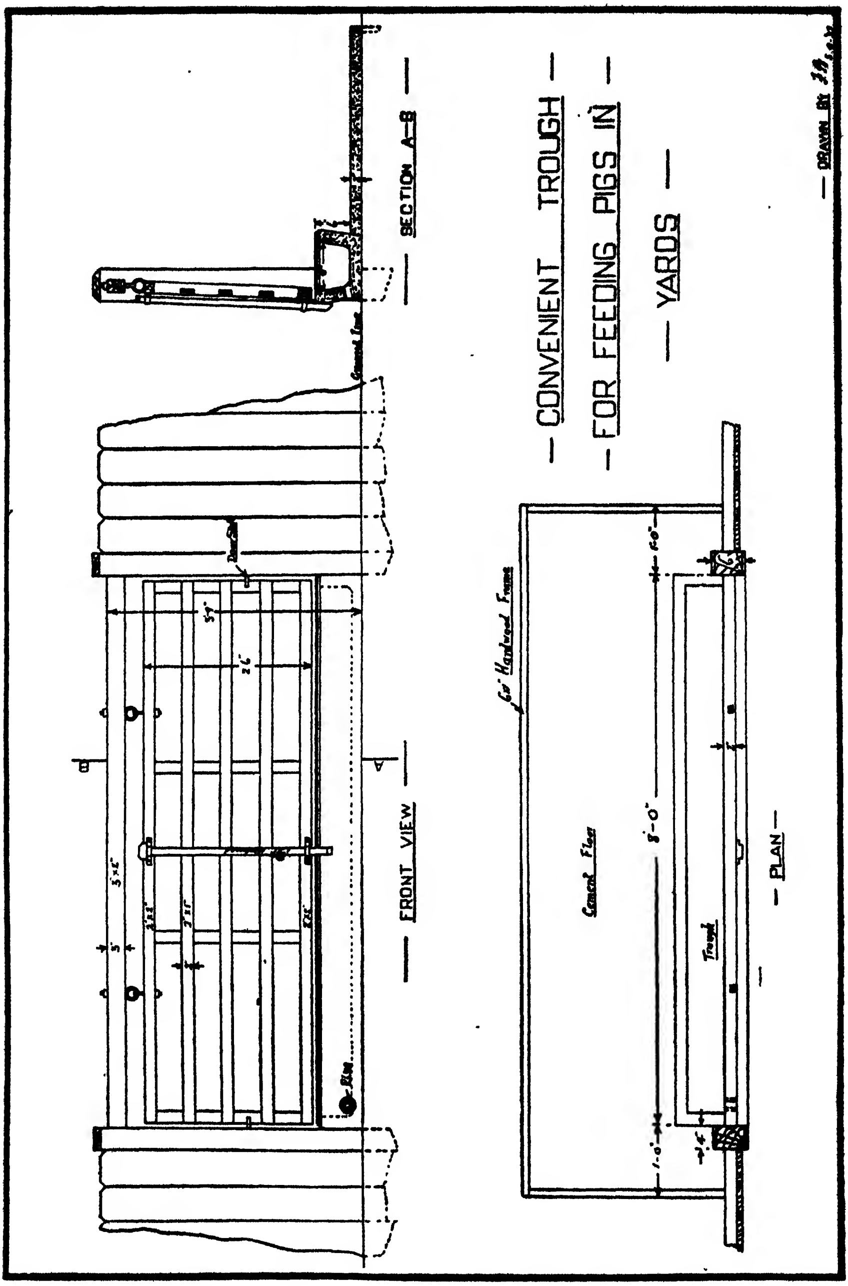

CONVENIENT TROUGH
FOR FEEDING PIGS IN
YARDS
SECTION A–B
FRONT VIEW
PLAN
Cement Floor
Trough
8'-0"
1'-0"

PLATE 200.

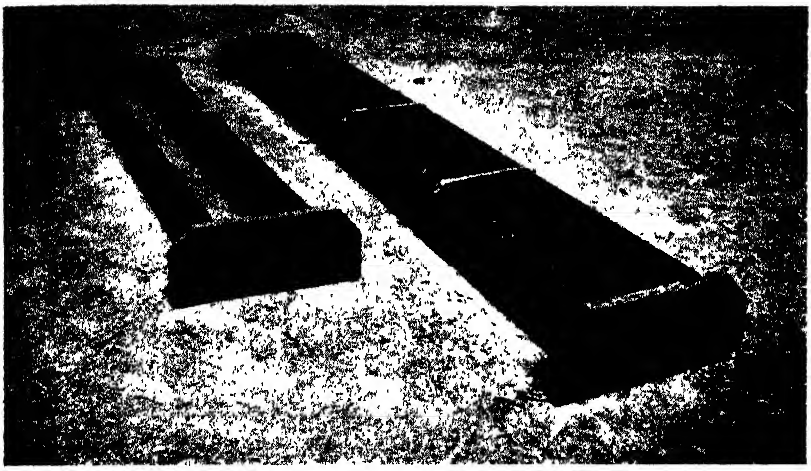


PLATE 201.—Handy V-shaped wooden troughs.

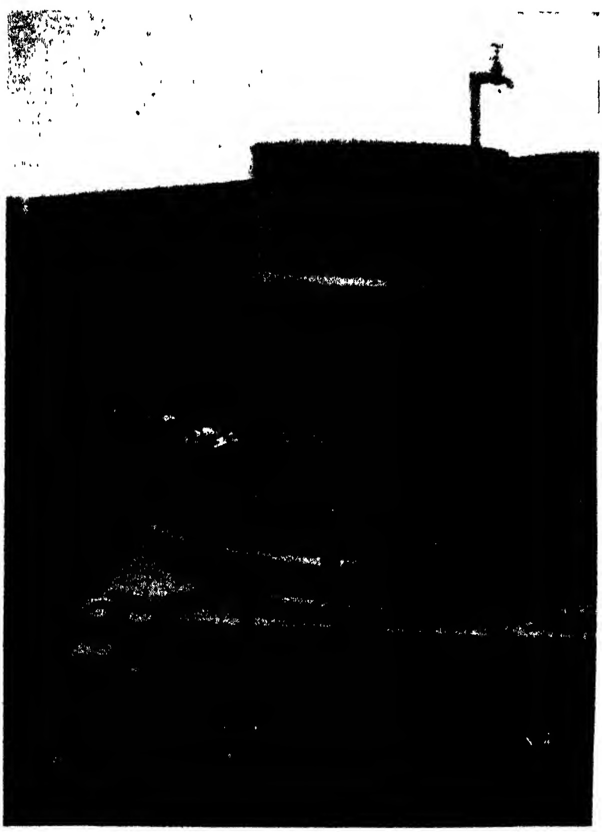


PLATE 202.—Automatic water fountain suitable for pigs in paddocks.

Plate 203 illustrates a type of self-feeder which has given satisfactory results in practice.

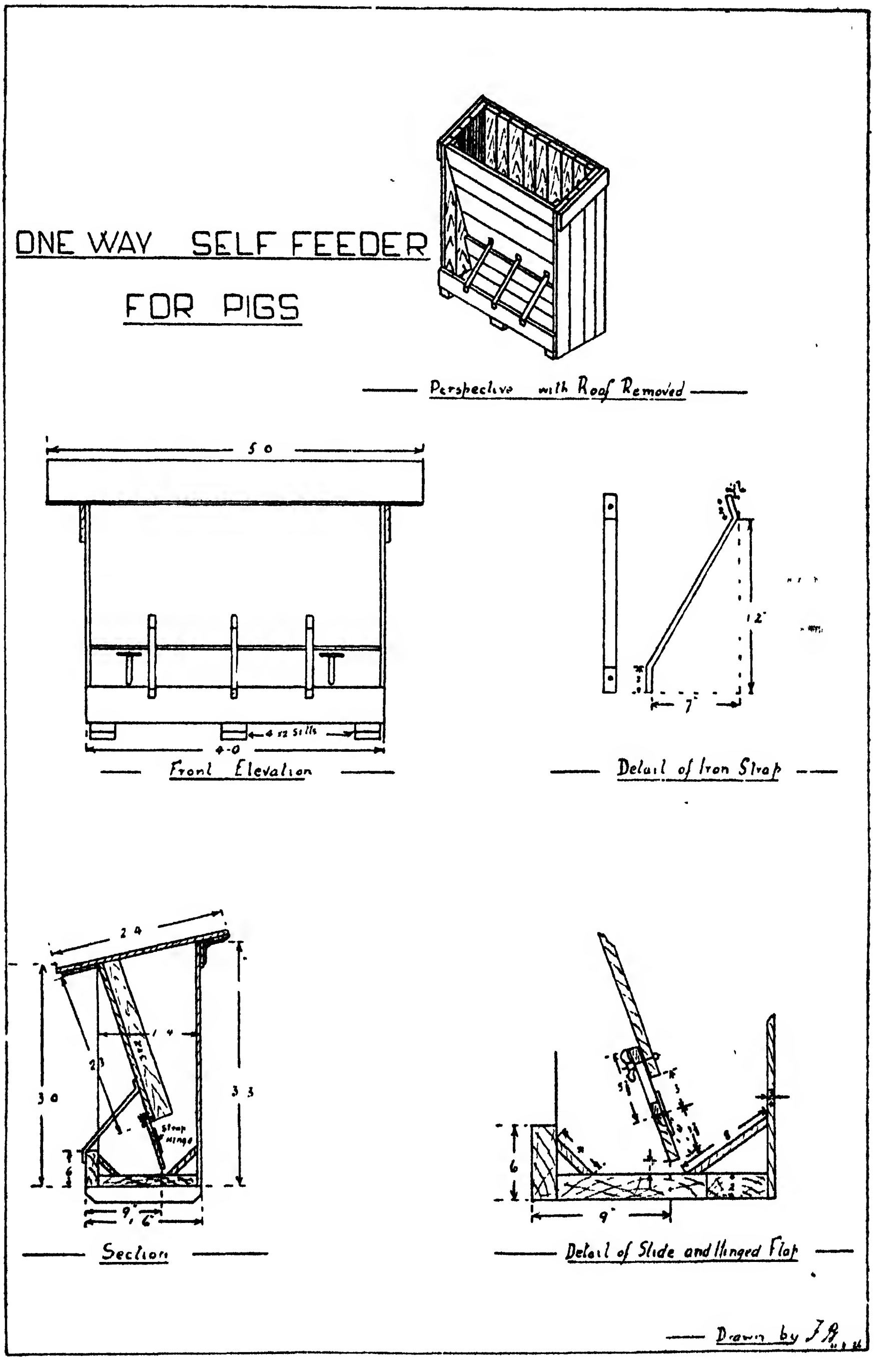


PLATE 203.

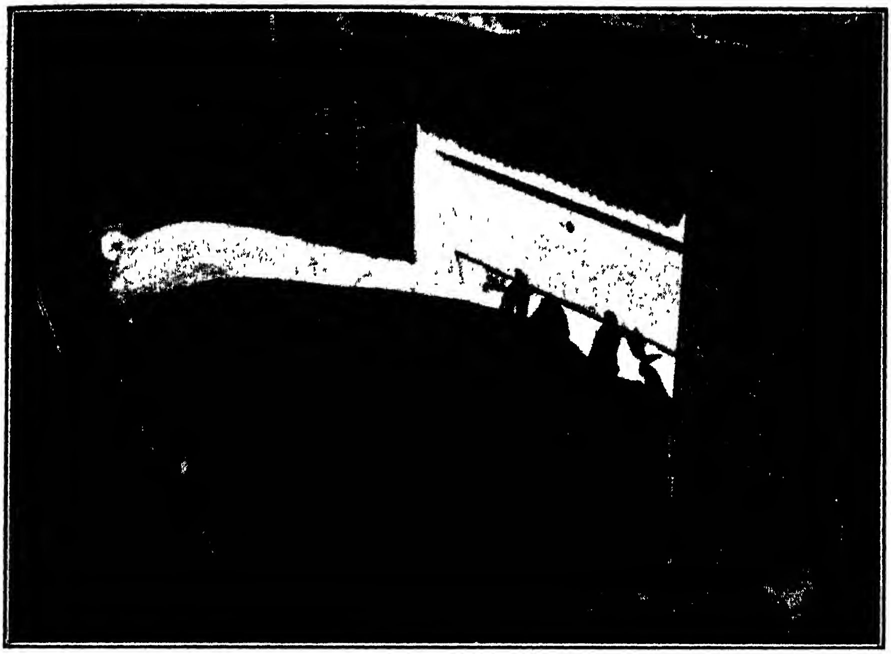


PLATE 204.

Baconers grown on the self-feeder, in which was placed a mixture containing 80 lb. maizemeal, 10 lb. lucerne chaff, and 10 lb. meatmeal. The pigs were also given unlimited supplies of drinking water.

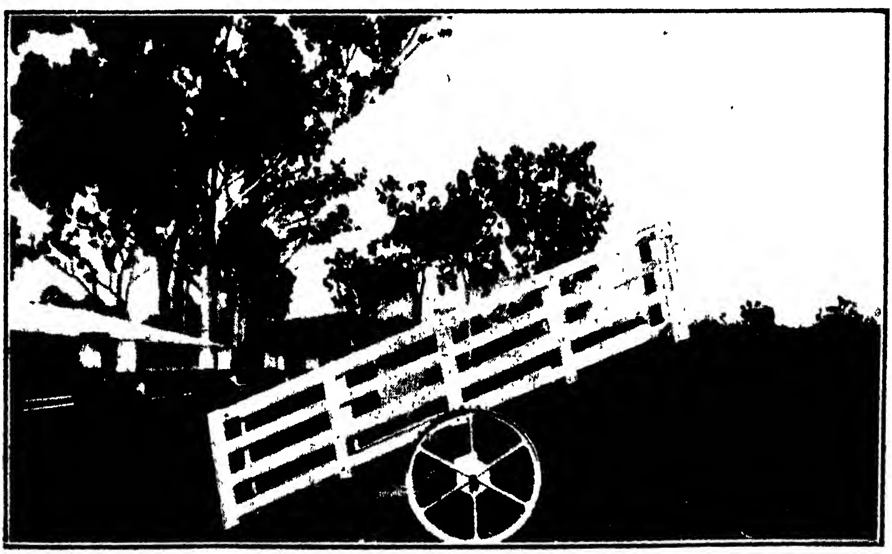


PLATE 205.

A useful portable loading race.

The grain-grower who keeps pigs but has no milk foods can make good use of his grain by feeding it in combination with such foods as lucerne chaff and meatmeal, both of which are substitutes for separated milk in the pig's ration. Such feeds as these are adaptable to dry-feeding through a self-feeder, whereby the pigs have several days' food supply placed in the feeder and they are allowed to help themselves. Under certain conditions, self-feeding has many advantages and is worthy of trial.

ONE-WAY SELF-FEEDERS FOR PIGS—MATERIALS REQUIRED.

Members.	Number.	Length.	Size.	Material.
		Ft. In.		
Skids	Three ..	1 6	4 in. x 2 in.	Hardwood
Trough	One ..	4 0	6 in. x 2 in.	Pine
Trough	One ..	3 10½	12 in. x 2 in.	Pine
Trough	One ..	3 10½	4 in. x 2 in.	Pine
Trough	One ..	3 10½	8 in. x ¾ in.	Pine
Trough	One ..	3 10½	4 in. x ¾ in.	Pine
Front Panels	Five ..	3 10½	6 in. x ¾ in. T. & G.	Pine
Front Panels	Two ..	2 3	3 in. x 2 in.	Pine
Sliding and hinged flaps	Two ..	3 10½	4 in. x ¾ in.	Pine
Ends and back	Twenty-four	3 3	6 in. x ¾ in. T. & G.	Pine
Ends and back	One ..	7 0	6 in. x ¾ in.	Pine
Top	Ten ..	2 4	6 in. x ¾ in. T. & G.	Pine
Top	Two ..	5 0	6 in. x ¾ in.	Pine

Hardware—Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

Shade.

Pigs should be provided with ample cool shade in hot summer months, either by planting shrubs or hedges or by building a framework of 3-in. by 2-in. hardwood and covering the top with bushes or thatching it with grass.

Weighing Pigs.

As pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per lb. varies according to specified weight limits, it is important to the pig-raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig-trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Even after years of practice, guessing the weights of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, for, with intelligent use, they soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

PLATE 206.

A wooden crate suitable for weighing pigs. Note the strong construction, "slide up" doors at both ends, and wires coming from bottom of crate to be attached to hook of the spring balance. Pine should be used in the construction of the crate so that its weight will not be too great.

PLATE 207.

A good feeding outfit in use on Mr. R. Turpin's pig farm, Lowood.

The weighing crate should be light yet strong; a convenient size for a crate to hold one bacon pig is 3 ft. 6 in. long, 2 ft. 6 in. high, and 1 ft. 6 in. wide.

If the weighing crate is arranged in a race, the pigs can be brought from their pen, weighed, and then returned to the pen conveniently.

PLATE 208.
Crate in position, ready for use, with front door closed. Note the arrangement of the top beam, lever, and spring balance.

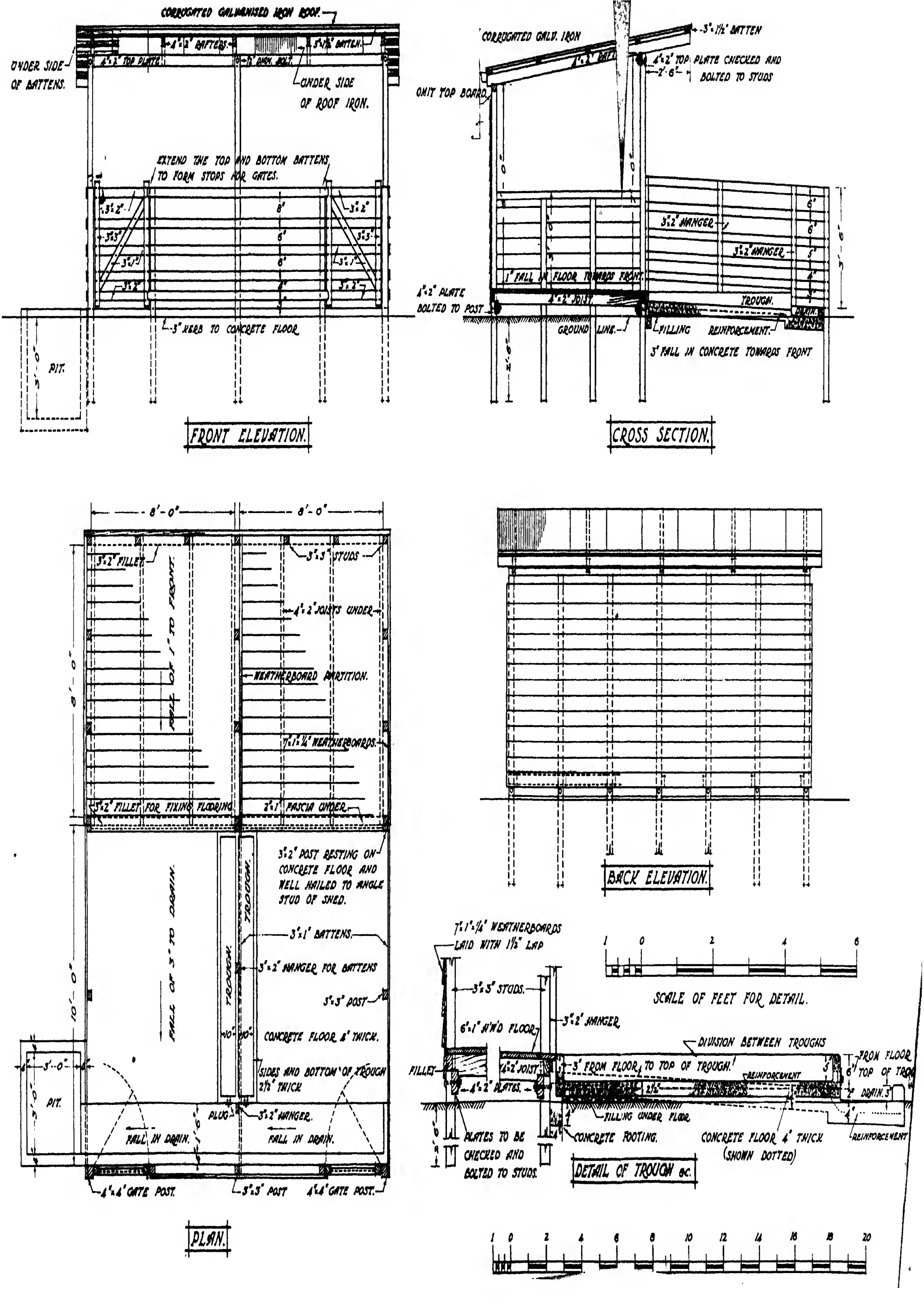
There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig-raisers.

LUCERNE SEED.

Quantities of lucerne seed that contain a more or less proportion of seeds that are stained red are now upon the Queensland market. This colouring indicates that the bulk in question has been grown outside the Australian Commonwealth.

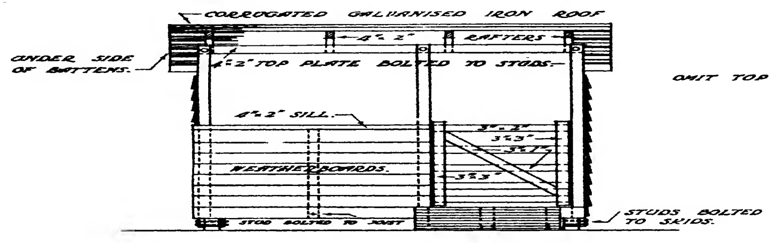
DEPARTMENT OF AGRICULTURE AND STOCK
— QUEENSLAND. —

PIG PENS FOR INTENSIVE HOUSING.

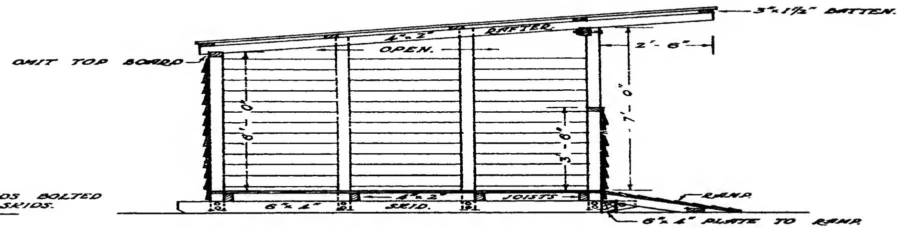


DEPARTMENT OF AGRICULTURE AND STOCK.
QUEENSLAND.

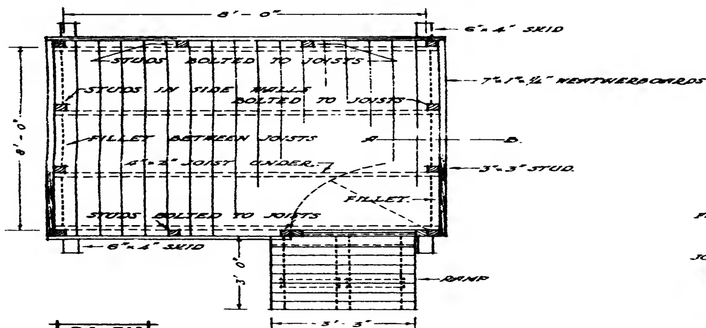
PORTABLE PIG SHED.



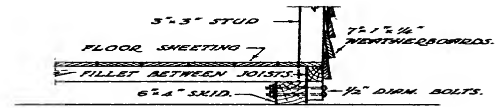
FRONT ELEVATION.



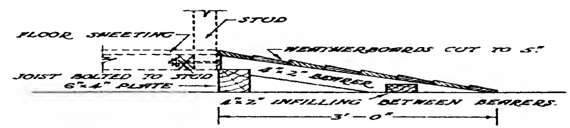
SECTION THROUGH SHED.



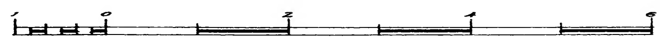
PLAN.



DETAIL SECTION A-B.



DETAIL OF RAMP.



SCALE OF FEET FOR DETAILS.

SCALE OF FEET FOR PENS.

PLATE 209.—AN OBJECT LESSON IN PLANT GROWTH.

Members of the Devon Park State School Project Club making observations on crop development in one of their farming plots. Miss M. I. Reeve is the teacher in charge.

PLATE 210.—A TEDIOUS JOB, BUT A LABOUR OF LOVE.

Devon Park Project Club members at work weeding. This new club was formed last August, and the little secretary, Patricia Pearce, writes to say how hard and tedious was the work of digging and preparing the plot for its first crop of pearl millet and sacchaline. The presence of nut grass made the job more difficult. A stray horse in search of a juicy bite caused the first big disappointment. Rain came and turned dismay into joy. A fine crop grew to a great height. When ripe for harvest, a flock of parrots raided the seed heads, and so spoiled a good show exhibit. The disappointing experiences proved, however, a spur to bigger effort, and the club has now a winter grass and fodder plot advancing well towards profitable maturity.

Activities of the Wool and Sheep Branch.

FARMERS' WOOL SCHEME.

THE officers of the Wool and Sheep Branch are of the opinion that young graziers are not fully aware of the help available to themselves in the problems arising in connection with their industry. In these notes, therefore, an effort will be made to bring home to those graziers desiring advice the nature of the help awaiting them on application.

The correspondence dealt with continues to increase year by year, and the subjects touched on embrace a variety covering a wide field. We now deal with over 600 regular correspondents, some of whom write throughout the year.

Interviews at Head Office on all subjects dealing with the sheep and wool industry are constant and daily occurrences.

Visits to sheep properties are undertaken on the application of those interested, free of charge, and advice and instruction given when required.

Culling the Ewe Flock.

Considerable work on this important yearly operation has been undertaken during the last few years. It is the object of the officers concerned to teach graziers to do this work themselves, and, above all, to emphasise the necessity of culling regularly as one of the ordinary operations. There is no quicker road to success than in the elimination of the cull and the retention of the better animal and the one, too, suitable to a particular district. It is our desire, also, to see the culls fattened and eventually going into mutton consumption, rather than being passed on to another selector for breeding purposes. With culling should go hand in hand the use of better rams. Work in the selection of rams has gone on apace, and it is gratifying to be able to state that graziers are taking more care in the selection and use of rams. There is probably no greater economy, in the long run, than the expenditure of a few extra pounds on rams, provided the necessary knowledge is available to choose the right type for a particular district. Studmasters have been approached with the object of getting them to type their sale flock rams, so that graziers are enabled to secure the type advocated, and not, as formerly, having to take fine, medium, and strong in the one run.

Woolclassing.

Woolclassing in the sheds is one of our ordinary occupations throughout the year, and here again every effort is made to teach the small grazier to set out his lines correctly. There has been a feeling, whilst prices for the staple have been depressed, that the correct get-up of a clip has been an unpayable proposition. No greater mistake could be made. With the low prices ruling, the necessity arises to get every penny available for the commodity, and this may be brought about by scientific classing.

Experimental Work.

Officers of this branch are from time to time approached by vendors of new specifics proposed to be used in the sheep and wool industry. Whenever possible, these materials are tried out in a practical way in the endeavour, first of all, to protect graziers' sheep from injury, and,

secondly, in the search for something better than the specifics now recommended.

Health of the Flock.

Health of flocks is of paramount interest to officers of the Wool and Sheep Branch, and in this connection our advice is often sought when visiting the various holdings.

Weeds and shrubs believed to be poisonous or detrimental to the health of the sheep are collected on properties where such have been reported. These are submitted to Mr. White, the Government Botanist, and owners advised what course to take for the eradication of the pest.

Advice is constantly being given with regard to blowfly strike in sheep, and practical demonstrations have been carried out with regard to jetting.

Dipping.

Dipping for the eradication of external parasites has been carried out on various holdings. The spread of lice and ticks in South-western Queensland and on the Darling Downs has been rapid during the last few years, and graziers would be well advised to quickly take this matter in hand. If allowed to spread, the loss in both quality and weight of the fleece is extremely serious. The matter of the spread of external parasites in sheep is regarded with grave concern by the Department of Agriculture and Stock, and iti is possible that, at no distant date in the future, steps will be taken to bring under the notice of sheepowners that clause in the Diseases in Stock Act which provides for the compulsory dipping of infested sheep in certain areas and on the stock routes.

Many satisfactory proprietary dips are offering, and owners should carefully follow the directions given as to mixing. One dipping annually with the right material and carried out from one month to two months off shears should be sufficient to eventually free the property from this pest.

General Practice.

Advice with regard to drought feeding has been sought during a portion of the year just passed, and on all occasions information has been supplied having due regard to the economic aspect of the case.

The prescription of sheep licks for different districts and conditions forms one of our activities. In this connection it is well to note that although many good sheep licks are on the market, graziers would be well advised to consult the Department before purchasing. A lick, even if to be recommended for one locality, is not necessarily suitable elsewhere.

The selection of areas suitable and economical for ringbarking purposes has been carried out during the year, and it is certainly a step in the right direction. The selector who makes two blades of grass grow where previously there was only one or none has certainly not lived in vain.

Our advice is freely sought in the matter of improvements. Always with the proviso against over-improvement, instruction is given in such subjects as the erection of shearing sheds, the layout and construction of drafting yards, the economical erection of fences, and the provision of water.

Fat Lamb Raising.

Some considerable time has been spent on the Fat Lamb Scheme inaugurated by the Minister, the Hon. Frank W. Bulcock, last year.

Suitable farmers were supplied with rams of British breeds with the object of demonstrating to those engaged in the industry the best crosses for the purpose. A great deal of interest has been taken in the scheme, and the results achieved, measured by the lambs already forwarded for sale, are bound to have lasting and beneficial results. It is hoped that the scheme may be extended this year, and that some attention will be given to producing the right type of ewe, so necessary to further the production of the right lamb for export.

Farmers' Wool Scheme.

The Farmers' Wool Scheme, carried out by officers of the Wool and Sheep Branch of the Department of Agriculture and Stock, was brought into being twenty years ago, as the result of the recognition of the fact that farmers with small parcels of wool did not receive market value. Bales, bags, and butts are now received under this scheme, and scientifically classed into large lots, when that is possible. When offered for sale under the Department's own brand, the wool consequently meets with the competition of all buyers, and is, in fact, treated in just the same manner as a station clip. The prices received, compared with the average obtained from all wools offered, have been exceedingly good, having regard to the wools we receive for treatment. Farmers and others would be well advised to avail themselves of the benefits to be received under this scheme. Pastoralists and graziers, too, would be well served if they consigned that odd butt or bag which is so often seen in a woolshed. The cash advance of 60 per cent. of the estimated value of the wool, free of interest, should be acceptable to all those who are free to avail themselves of the advantages of the scheme.

The following are the conditions under which wool may be received for classification and sale:—

1. The Minister for Agriculture and Stock is prepared to assist woolgrowers to obtain the best prices for their wool from—

(*a*) Holdings of less than 1,500 merino sheep;

(*b*) Wool from crossbred and British breeds from any holding;

(*c*) Bags and butts from any holding;

(*d*) Star lots from our present selling agents.

The wool will be received for classification and placed on the market to best advantage for sale.

2. A correct account of the wool will be kept, and each woolgrower will be paid the amount received for same, less the necessary broker's and other charges, which are as follows:—

(*a*) A charge of 10s. per bale for classification. (This charge also includes insurance in sheds, on rail, transit to selling broker's stores.)

(*b*) All freight, cartage, handling, broker's charges, bale account, &c.

3. The Department of Agriculture and Stock will charge no commission. An advance of 60 per cent., free of interest, will be made upon the estimated value of the wool as at the time of its receipt in the Department's store. The freedom from interest on the advance will not apply to wool from crossbred and British breeds and bags and butts from holdings of more than 1,500 sheep.

4. The wool will be sold as soon as possible following a sufficient accumulation to enable the wool to be sold to best advantage.

5. The weights as taken in the Departmental store and the classification before sale are to be accepted as final.

6. Woolgrowers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, when consigning the wool, advice of which, with all particulars, should be given.

7. Consign the wool to the Under Secretary, Department of Agriculture and Stock, Roma street.

RECOMMENDATIONS.

(*a*) The bales should be branded with initials and numbers on the top only, so that the same pack, if in good order, may be used again. This saves the price of a new pack to the grower.

(*b*) All merino wool should be kept separate from other grades and breeds.

(*c*) Locks and belly wool should be kept separate.

(*d*) Remove all dags and wet stains before rolling the fleece. The wool requires no other treatment on the farm.

SALE OF WOOL.

The wool will be sold as soon as possible by wool brokers in rotation as arranged by the Department of Agriculture and Stock.

PLATE 211.—FIRST FRUIT OF PROJECT CLUB WORK
A Saccaline Plot, Devon Park State School, near Oakey.

UNDER average rainfall conditions remain the prominent feature of the present agricultural outlook, although the position has been relieved in the Lockyer Valley and portion of the Darling Downs.

The season has been very unsatisfactory for the establishment of winter grasses and clovers and is now too advanced for obtaining the best results.

CEREAL CROPS.

The Queensland Wheat Board received 3,670,000 bushels from the 1934-35 crop, which figure does not include grain retained by growers for seed and feed purposes. Given favourable weather conditions, an increased area should be sown during the present season. In the Dalby district, particularly at Pirrinuan, new settlers are preparing land, encouraged by the excellent results obtained in the district from the recent crop. Early sown crops are making fair growth but will shortly require further rains. On weed infested areas, a late sowing may not be an unmixed evil, as it will permit of a final late cultivation to destroy weed seedlings.

The intake of grain for the 1934-35 season by the Queensland Barley Board totalled 113,503 bushels, comprising 94,014 bushels of malting barley, 11,201 bushels of cape, and 8,590 bushels of feed. Satisfactory sales were made to Queensland brewers.

PEANUTS.

Heavy deliveries of seeds are being made to the silos at Kingaroy and a record crop is indicated. The Board is optimistic of clearing the crop, estimated at 5,000 tons from 12,500 acres. Sales are expanding and Australia's consumption definitely increasing, so that growers cannot afford to reduce their acreage if the Board is to maintain continuous supplies. The Northern Territory also contributes to Australia's peanut supplies, the present crop being estimated at 400 tons.

TOBACCO.

The opening tobacco sales were held during May, values being maintained at the previous season's level, up to 4s. per pound being paid. The quality of the new season's crop was favourably commented on by buyers. Curing is still in progress, while the late sown crops in the North are still to be harvested.

RECLAIMED PEAR LANDS.

Within the last three years over sixteen million acres of reclaimed pear land have been available for settlement in Queensland. Development is proceeding, the work of fencing, ringbarking and the provision of water being assisted in many instances by advances from the rural development funds.

Of the total area made available over fifteen million acres have actually been taken up.

SOIL EROSION.

With closer settlement and the continuous cropping of our most fertile agricultural areas, a system of permanent agriculture, such as practised in the old world must now receive serious consideration.

The destruction of forests and the subsequent cultivation is now causing decreased fertility which by the depletion of organic matter in the soil renders the land more liable to further loss by erosion and gullying. An enormous area of valuable land has been rendered worthless in U.S.A. by such agencies, and the prevention of further loss is now being tackled in earnest. The same process is now taking place in our own State, more particularly on the coastal lands where hillside farming is the rule. Sheet erosion is also active on even gentle sloping agricultural lands were the soils are incapable of absorbing the storm rains, thus removing valuable plant foods more rapidly than is done by continuous cropping. Fortunately the systematic construction of terraces and broad base contour drains will do much to retard the erosion and eventual ruination of such lands and farmers are urged to immediately take stock of their individual position in this regard. Rotation of crops and the laying down of strips of pasture will also be of assistance in combating loss.

SUGAR.

Present crop estimates indicate a lighter cane tonnage than last year, and a corresponding lower output of sugar—due to an unusually dry summer. The shorter ratoon and plant will, however, be balanced in some districts by heavy cuttings of standover cane.

In most districts seasonal conditions have favoured a satisfactory cane yield. Even in the far North, where the summer was extremely dry, a later improvement in growing conditions benefited crops considerably, although they are still backward for this time of the year. Fortunately, insect pests were not nearly so active or numerous as they are in seasons of normal rainfall, and that fact, added to the absence of flood damage, has evidently provided ground for the optimism that is apparent in present mill estimates of the probable tonnage to be crushed. Good cane tonnages are assured in the Burdekin area.

The Mackay crop, as it stands at present, is, on the whole, giving promise of fair average quality and yield.

From Bundaberg southwards, growing conditions have not been entirely favourable, although the cane left over after the last crushing should insure heavy cane deliveries at most mills.

The official estimate for the coming harvest provides for an anticipated yield of 4,130,000 tons of cane. Allowing 7·1 tons of cane for the manufacture of 1 ton of sugar, the factory output should approximate 581,700 tons of sugar, as compared with an actual production of 611,727 tons last year.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled for the month of April, 1935 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Redberry of Rosehill	W. Flesser, Boyland	15,431·96	560·956	Masher of Oakvale
Blossom II. of Oakvilla (229 days)	H. F. Marquardt, Chelmer	13,330·58	523·81	Victory of Greyleigh
Gold III. of Oakvilla	H. F. Marquardt, Chelmer	12,380·57	495·435	Victory of Greyleigh
Blackland's Choice 4th	A. Pickels, Wondai	10,244 86	444·36	Fussy's Monarch of Hillview
Doris 6th of Hilton	E. O. Althouse, Cloyna	10,285·76	357 764	Warrior 16th of the Cedars
Ruby 3rd of Headlands	E. O. Althouse, Cloyna	8,967·34	351·439	Duchess Jellicoe of Fairfield
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Rocklyn Jean	T. Strain, Wondai	8,977·17	377·936	King of Sunnyside
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Mabel 10th of Sunnyside	Paul Moore, Wooroolin West	9,138·74	371·297	Countess Lad of Cosy Camp
Rosemount Nancy 17th	F. G. Lamkin, Kaimkillenbun	7,740·13	317·761	Bright Star of Cosy Camp
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Gentle II. of Alfavale	W. H. Thompson, Nanango	10,940·56	502·575	..
Alfavale Midge	W. H. Thompson, Nanango	11,658·08	425·069	..
Kurrajong Tina	T. Strain, Wondai	8,412·00	388·066	Cosy Camp Newhaven
Marn June 2nd	R. Martin, Biggenden	5,976·6	267·706	Happy Valley Happy Lad
Model 6th of Alfavale	W. H. Thompson, Nanango	8,657·49	399·233	..
Lavender 5th of Blacklands	A. Pickels, Wondai	9,032·98	338·692	Blacklands Major
Rocklyn Melba	T. Strain. Wondai	7,490·5	310·947	Oakvilla Champion Prince

JERSEY.

MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Majestic Queen of Brooklands	R. S. Conochie, Sherwood	11,184·65	618·517	His Majesty of Dalebank
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Oxford Sister	M. J. Dunn, Laidley	6,751·7	318·443	Oxford Silvius
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Overlook Remus Frances	E. Burton & Sons, Wanora	9,130·39	519·969	Plemont Remus
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Brooklands Bronze Plate	R. S. Conochie, Sherwood	10,396·35	517·289	Forward of Brooklands
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Shamrock IV. of Ryfield	P. Fault, Cushnie, *via* Tingoora	9,017·32	339·284	St. Athans Angus
Cabulcha Butterfly	J. M. Newman, Caboolture	6,001·65	281·47	Grasmere Autocrat
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Brooklands Royal Mabel	R. S. Conochie, Sherwood	8,606·85	456·141	Retford Earl Victor
Brooklands Royal Belle	R. S. Conochie, Sherwood	5,379·6	327·431	Retford Earl Victor
Oxford Buttercup 9th (272 days)	E. Burton & Sons, Wanora	5,196 5	306·07	Oxford Robin
Trinity Fancy Bloom (231 days)	J. Sinnamon & Sons, Moggill	4,942 5	274·702	Some Hope
Daffodil of Woodbine	J. Williams, Wondai	4,593·03	258·217	Trinity Armlet
Trinity Dreaming Bell (231 days)	J. Sinnamon & Son, Moggill	5,149·6	257·111	Trinity Dreaming Pioneer
Cabulcha Butterfly 2nd	J. M. Newman, Caboolture	4,898 8	250·564	Grasmere Autocr t

FRIESIAN.

SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Oaklands Colantha Lady	W. Richters, Tingoora	9,122·55	351·246	Colantha Lad of Oaklands
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Oaklands Winana Rock V.	W. Richters, Tingoora	5,995 73	248 29	Pied Rock

TUBERCLE-FREE HERDS.

The following herds have been declared free from tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free :—

Owner.	Address.	Number in Herd.	Expiry Date.
H. H. Dight	Warwick	37	24/10/35
R. A. Slaughter	Clifton	16	31/10/35
Paterson & Paterson	Croxley, Oakey	78	28/11/35
Grimmett & Son	Sherwood	61	1/12/35
Clayton Brothers	Tinana	95	20/2/36
E. H. Heale	Riverdale, Kureen	34	22/2/36
C. Sentinella	Graceville	43	1/3/36
G. T. Fleming	Edge Hill, Cairns	25	16/3/36
D. R. Hutton	Cunningham	42	22/3/36
Mrs. F. Thomason	Highleigh, *via* Cairns	131	28/3/36

ABORTION-FREE HERDS.

The following herds have been declared free of contagious abortion (Bang's disease), in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner.	Address.	Number in Herd.	Expiry Date.
H. H. Dight	Warwick	37	24/10/35
Grimmett & Son	Sherwood	61	1/12/35
F. P. Allan	Stoneleigh, Oakey	63	1/2/36
Clayton Brothers	Tinana	95	20/2/36
C. Sentinella	Graceville	43	1/3/36

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

THE ROTHAMSTED REPORT.

The appearance of the Rothamsted Report is an annual event of some importance to all interested in the technical advancement of farming. Agricultural advisers, teachers, and students, as well as the growing body of well-informed farmers derive from its pages a considered statement of the results of the past year's experiments on plant nutrition and plant disease. For many readers the conclusions drawn from the experiments will suffice; but for the increasing number of technical readers who are interested in the development of field experimentation there is a section dealing with the design and presentation of the results of experiments and the use of tests of significance. For all the more important experiments and those showing new features of design the plans and individual plot yields are set out in full. Summary tables follow, and the appropriate standard errors are clearly indicated.

The report falls into two sections, one dealing with the field work on fertilizer and cultivation problems at Rothamsted, Woburn, and many outside centres in various parts of England; the other, summarising the laboratory investigations whose details are to be found in the fifty-two scientific papers and twenty-nine technical papers published in 1933.

In recent years uniform schemes of field experiments conducted at a number of centres have largely taken the place of the isolated trial, and in the present report will be found summaries of three series of this kind. One deals with the results of ten years' experiments on malting barley, a second sets out the first year's results of an investigation of the fertilizing value of poultry manure, the third deals with the effect of fertilizers on the yield and quality of sugar beet. A useful review of ten years' fertilizer experiments on potatoes has been included, and a condensed summary of the main findings of fifty years' work at the Woburn Experimental Farm.

Turning now to the laboratory work, full abstracts of all scientific papers are provided, but mention should be made of several lines of work whose bearing on current problems is direct and immediate.

On the chemical side a comprehensive study is being made of the determination of manurial requirements of field soils by means of laboratory tests, using the now extensive body of accredited fertilizery experiments built up in recent years. A study of cultivation problems in the field is being made by the staff of the Physical Department, an aspect in agriculture that becomes increasingly important as farm mechanisation proceeds. Two aspects of the question in particular are receiving attention. Rotary cultivation, being fundamentally different in its action from the traditional methods, is being studied in relation to the nature of the tilth produced and its effect on the germination and growth of the crop. Contrary to the common idea the tilth produced by rotary cultivation differs from an ordinary seed-bed, not so much in its fineness, but rather in its openness or fluffiness, as direct measurements in the field have shown. Another important series of experiments test intensive against normal cultivations, the latter being just sufficient to keep down weeds. Up to the present no definite benefit has resulted from the extra stirring of the soil. This point is important, and is being followed up.

The study of the purification of effluent waters for agricultural industries, successfully undertaken by the Microbiological and Fermentation Departments in the case of beet sugar factory effluents, has now been extended to the more difficult problems of milk factory effluents. Work on virus diseases continues, and a detailed investigation of the causes in the fluctuation of insect populations is now in progress. Problems of bee management have been studed at Rothamsted for some years. At the request and with the active support of practical beekeepers this work has been extended to include the investigation of bee diseases, and a start has been made on the serious and obscure brood diseases of which the European and American Foul Brood are the most important. In the Insecticide Department important studies on pyrethrum and other vegetable poisons are reported. The crops themselves can be produced in the tropical and temperate parts of the Empire.

The report contains a valuable section dealing with the contributions of Rothamsted to the development of the science of statistics written by Professor R. A. Fisher, formerly head of the Statistical Department. This work has had a profound influence on the design and interpretation of biological experiments and the field arrangements developed are in use all over the world. In 1933 a beginning was made in the study of the technique of feeding experiments. An account is given of an experiment on pig management designed to test the possibility of applying to animal experiments the methods that have been so successful in modern field trials. Conclusive results were obtained, showing the necessity of green food for the growing pig and the advantage of wet over dry feeding. The number of pigs run together in a pen had no appreciable effect on their performance.

Answers to Correspondents.

BOTANY.

Fungi.

J.C. (Brisbane)—

It is not possible to say what the particular species a mushroom described by your correspondent is, as several species are found in Australia, and at least three or four of these occur in Queensland. From the description and size, we are inclined to think it is *Panus conchatus*, which emits a white light. Another sometimes found on tank stands, stumps, &c., is *Hiatula Wynniæ*. In place of the usual white or yellowish luminosity, this particular species, which is quite small, gives a bright green light. The luminosity of these fungi, or mushrooms, is not phosphoresence in the true sense. The glowing cannot be produced by heat, nor is it due to the formation of some readily oxidisable compound of phosphorus in the fungus. It is essentially a phenomenon associated with life, and disappears on the death of the organism. Professor D. McAlpine, a recognised authority on Australian fungi, and who has studied the luminous ones in Australia, regards the light produced as a form of energy set free in the process of destructive chemical changes in the living cell.

Misnamed Native Trees.

M.H. (Theodore, Dawson Valley)—

The specimen represents *Pittosporum phillyroides*, a native tree found in all the Australian States, with the exception of Tasmania. We do not think, however, it is anywhere very abundant. It is sometimes called "Native Willow," and we have not heard the name "native orange" applied to it. The latter name we have generally heard given to *Capparis Mitchellii*, the Bumble Tree. The name "Yellowwood" is given to two other trees in Queensland, of which one is a fine timber tree, *Flindersia Oxleyana*, common in coastal and sub-coastal jungles or rain forests; the other, *Terminalia bursarina*, common in the neighbourhood of Emerald, and causes "staggers" or "shivers" in sheep. Your *Pittosporum* is rather a handsome tree, and worth growing on account of its ornamental fruits. The flowers also, though small, are pleasing, and, if we remember rightly, scented rather sweetly. It is somewhat different in appearance from most other members of the *Pittosporum* family.

Plants from Charleville Identified.

H.B. (Charleville)—

(1) *Bassia uniflora;* (2) *Bassia echinopsila;* (3) *Rhagodia parabolica;* (4) *Atriplex Muelleri.*

Specimens Nos. 1, 2, 3, and 4 are all members of the Saltbush family. The fodder value of them varies. No. 4 is one of the commonest Saltbushes in many parts of Queensland, and in some districts stock are said to reject it, but in others it is regarded as quite good fodder. Generally stock seem to prefer it when it is dry to when it is green and luxuriant.

5. *Myoporum deserti.*—This plant is allied to the Fuchsia (*Eremophila maculata*), but, unlike that plant, it does not contain a prussic-acid-yielding glucoside. It has, however, been proved definitely by feeding tests to be poisonous to stock, but what the poisonous principle is has not been determined. Acute constipation and intense inflammation of the digestive tract are features of *Myoporum* poisoning. Most of the trouble occurs in travelling stock.

6. *Alstonia constricta*, commonly called "Native Cinchona" or "Quinine Bush." So far as we know, it does not contain any poisonous properties. The bark is sometimes use as a tonic.

Veldt Grass.

J.B. (Jimbour)—

The specimen of *Eriochloa* forwarded by you does not represent Veldt grass. Veldt grass has been tried spasmodically in Queensland, but does not seem to thrive here. Climatic conditions in the southern parts of Western Australia, where Veldt grass thrives, and in Queensland are different. Most Cape plants require a winter rainfall and a dry summer. The *Eriochloa* early spring grass is a native of your district.

Tick Trefoil.

G.H.L. (Gympie)—

The specimen represents *Desmodium triflorum*, a species of Tick Trefoil. The name "Tick Trefoil" refers to the fact that the small pod breaks up into a number of pieces each armed with several hooks or bristles which stick to clothing, the hairs of animals, &c., and thus are carried about. The plant is a legume and quite a valuable forage. The only disadvantage it possesses is that in heavily grazed paddocks it grows rather close to the ground to enable cattle to get much of a bite.

Trees for Charleville District.

A.O. (Charleville).—The following trees listed should do well about Charleville:—

Celtis sinensis, the so-called Portugese elm. We do not remember seeing any of these trees growing about Charleville, but they are well worthy of trial and, we think, would be an acquisition to the district. The leaves make excellent fodder for cattle. They are deciduous for a short time during the winter, but this is of no great consequence, as shade is no great consideration during the winter months. You may have difficulty in obtaining this through the ordinary commercial channels, but we think the Botanic Gardens, Brisbane, could supply.

Melia dubia, White Cedar. This does very well about Charleville, but it is rather subject to borer attack.

Schinus molle, Pepperina Tree or Pepper Tree.

Sterculia rupestris, Bottle Tree.

Sterculia diversifolia, Currajong.

Bauhinia Hookeri, Native Bauhinia or Western Ebony. One of the most beautiful trees that can be grown in the West. It is very slow-growing. We think the Botanic Gardens, Brisbane, has it in stock and could supply.

Phytolacca dioica, the Bella Sombra Tree. We have not seen trees of this growing as far west as Charleville, though we have seen one or two good specimens about Roma. It is a remarkably quick-growing tree, but has rather a swollen, gouty stem. Like the Celtis, the leaves are excellent fodder for stock.

In addition, the following are worthy of trial as possibly growing quite well in your district:—

Flindersia australis, Crow's Ash.

Jacaranda mimosæfolia, Jacaranda.

Ficus spp. Any native Fig such as the Moreton Bay, Port Jackson, &c.

Calodendron capense, Cape Chestnut.

Pinus spp. Any variety of Pine.

Nephelium tomentosum.

Schotia brachypetala. A beautiful red-flowering tree.

You might find some of the trees listed difficult to obtain through the ordinary commercial channels, but we think the Botanic Gardens, Brisbane, could supply them in most cases. The Botanic Gardens, Brisbane, are not under the control of the Government, but under the Brisbane City Council, and we think a charge is usually made of 2s. per tree, plus, of course, carriage. As the planting of some of these unusual trees would be in the nature of an experiment and of educational value, you might, perhaps, approach your own Department or the Brisbane City Council to help you in the matter.

Parramatta Grass.

O.B. (Innisfail)—

The specimen represents *Sporobolus Berteroanus*, sometimes called Parramatta Grass, also Rat's Tail Grass; very common in coastal Queensland; found in old cultivation paddocks, or anywhere where the ground has been disturbed. It is a very tussocky, hard grass, and though stock eat it readily enough in its young stages, they do not care for it so much when old, and on the whole its palatability and nutritive values are rather low. It has caused some concern on parts of the near North Coast between Brisbane and Landsborough, on account of it invading worn patches in paspalum pastures.

Rural Topics.

Wounds in Horses—Simple treatment.

The fundamental principle underlying all wound treatment is to endeavour to provide suitable downward drainage for the discharges from the wound. If such drainage is provided then most wounds tend to heal satisfactorily, but deep wounds penetrating downwards and which form pockets progress unsatisfactorily for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little interference beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds it is very necessary to judiciously use a knife in order to provide that the discharges can flow freely downwards.

Before any wound treatment is attempted it is desirable that the injured edges of the wound be clipped with scissors to remove the hair and reveal the true nature of the wound. The next step is to wash thoroughly with warm weak disinfectant solution. Then, if necessary, the depth of the wound can be explored with a blunt instrument which has been boiled or with the fingers after the hands have been thoroughly washed and scrubbed. A good and common example of an improperly drained wound is a nail or other puncture of the sole of the hoof. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature collects in the foot, continues to accumulate because it cannot drain away, and acute lameness follows. If unattended to these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by this time the structures within the foot are in a nasty mess and the case has become an extremely serious one.

To deal with these hoof punctures the whole foot is cleaned and, if possible, is held in a bucket of warm disinfectant solution to still further clean it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole over the point where pain is most acute or it is known that the foot was punctured. The apex of the cone must be carried right through the horn, and when this happens the corrupt fluids will escape and lameness almost immediately disappears. To prevent the hole filling up when treated, &c., a pad soaked in Stockholm tar is placed in position and held by a tin plate interposed between the sole of the foot and a shoe. If attended to thoroughly in the manner described these cases need little further attention beyond dressing once or twice weekly to ensure that the horn is not growing over before all the discharges have got away.

Skeleton Weed.

Numerous inquiries have been received recently at the Department of Agriculture and Stock regarding Skeleton Weed (*Chondrilla juncea*), a native of the Mediterranean Region and Central Europe, now one of the worst weed pests in the Riverina and much of the wheat belt in New South Wales. One shire has already approached the Government with a request that the plant be declared a noxious weed for the whole State. The Government Botanist, Mr. C. T. White, points out that the weed has not yet been found in Queensland, and that like many weeds of the New South Wales and Victorian wheat belts such as St. John's Wort and Stink Wort there is a hope that it may not establish itself here. Even when some of these plants such as blue weed or Paterson's curse do reach Queensland they generally fail to become the serious pests here that they are in the Southern States.

So that farmers, however, may keep a lookout for the weed it may be said that it has a long taproot, a rosette of lobed leaves at the base lying more or less flat on the ground, a branching stem bearing very narrow leaves and numerous yellow flowers of the daisy type. These have in their middle a few seeds which bear several rows of tooth-like prickles towards the top, and are surmounted by a slender stalk with a tuft of hairs at the top. New South Wales authorities state that seedlings are easily destroyed, and it is by pieces of the root and rot-stock carried about on farm inplements, &c., that the plant is usually spread. Farmers and others seeing any plant they consider might be Skeleton Weed are advised to send specimens to the Department of Agriculture and Stock for correct identification.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

WINTER INFECTIONS.

THERE are a number of infectious diseases which attack the air-passages and throat, and most of them are more common in the cold season. Of them the most frequent are the infectious catarrhs, which we call "colds," and the closely-allied infections called influenzas, which vary from slight illnesses to deadly epidemics. Their attacks confer only a short immunity, varying from a few weeks to perhaps twelve months. With other diseases of this class immunity is very lasting and may continue for the rest of life. Here we include measles, whooping cough, scarlet fever, and diphtheria. In all these diseases, whether slight or severe, complications occur due to secondary invasion of the air-passages, lungs, and ears, not so much by the virus of the original disease as by infective bacteria, which take advantage of the weakened resistance of the patient to cause bronchitis, pneumonia, and abscess of the ears. Except in diphtheria and the malignant forms of influenza, it is these complications which cause the most serious illnesses and deaths. The total mortality is large at all ages, particularly in young children, including infants in their first year.

How We Become Infected.

The living germs of these diseases exist in countless myriads in the secretions of the mouth, throat, and nose of the sufferers, but it is a great mistake to imagine that those who are sick in bed are the main source of danger. Few can be infected by them. The most dangerous are (1) those suffering from mild attacks, who move about freely among other people, (2) those who have recovered, but still have not become free of the disease germs, (3) those who by reason of their high resistance are immune to the disease, but though not sick themselves, carry the germs in their secretions, and so infect other people. These three classes of "carriers" are the chief spreaders of these diseases, and there is no way in which we can certainly avoid them.

The methods by which the germs are usually conveyed from person to person are very simple. The most common is by coughing. Every cough expels great numbers of extremely fine particles, most of them so small as to be invisible. This invisible spray floats in the air as an invisible cloud around the carrier, until the wind blows it away, or until it very slowly settles down. It is easy to understand that any person near him cannot avoid inhaling the germs. The carrier is least dangerous in the open air; most dangerous in rooms with closed doors and windows. That is why these infections are most prevalent in winter. Where a number of people are gathered together in a hall some carriers are almost certain to be present. The danger increases with the degree of crowding and the greater absence of ventilation.

There is another method of spread which is especially frequent among children. We may call it the method of spread by "smearing." Most young children, having been taught no better, put their fingers into their mouths or rub them over their noses. These moist fingers are then applied to their clothes and toys, to the hands and faces of their playmates, and infect everything they touch. This method is very effectual in diphtheria and scarlet fever, which usually do not excite cough, but it applies to all the infections we are considering. Not only are diseases of the throat and air-passages conveyed in this way. The same is true of infectious meningitis, which has caused so many deaths in the past. Many believe that infantile paralysis is similarly spread by carriers.

How Infection may be Prevented.

Some people catch every infection; others seldom fall to them. In other words, we are not all equally susceptible; we have different degrees of resistance. Most susceptible are babies, young children, and people who are poorly nourished, in spite often of a sufficiency of food, and sometimes from over-indulgence in certain foods. Our milk-starved children are among those who suffer most. We must endeavour to build up resistance, and for this a good diet rich in vitamins is most valuable.

Resistance is a matter of degree. The poorly resistant may be infected by a small number of germs, which would not injure the more resistant, but might even increase their resistance. Yet the more resistant may be overcome by breathing in large numbers. As we cannot avoid these germs altogether, it is important to avoid taking in a large overwhelming dose of them. Fresh air and open windows are a safeguard; closed rooms and crowded halls are dangerous. Those who cough recklessly should be avoided; and children should be taught better habits. More particularly babies and young children should not be taken to picture shows and evening entertainments. School children must, of course, run some risk, but large classrooms and good ventilation without over-crowding would lessen these risks. Against diphtheria we are, fortunately, able to immunise them by preventive injections.

MATERNITY AND INFANT WELFARE.

The following paragraphs give point to the appeal for public assistance to the King's Jubilee Fund:—

Proper training of doctors, nurses, and midwives in maternal and infant welfare is essential. The King's Jubilee Fund for preserving the lives of mothers and children aims to secure this result. Your contributions and co-operation are needed.

A vital need is the establishment of ante-natal and post-natal services for mothers in city and country. Upon the welfare of mother and child depends the strength of the Australian race. Therefore, support the King's Jubilee Fund, whose proceeds will be devoted to maternal and infant welfare.

How many of the general public realise that one mother in every two hundred pays the supreme penalty for maternity? There may be features which qualify these statistics, but when one recognises that in some hospitals there are no deaths at all, it is obvious that reform is possible. Therefore contribute and work for the King's Jubilee Fund to advance the cause of motherhood.

The Jubilee Fund to assist maternal and infant welfare takes the form of a gift to the King and Queen to celebrate the first twenty-five years of their reign. There is an obligation on every son and daughter to contribute.

Queen Mary is something more than the British Queen; she is a mother. Australians know three of her sons by personal contact—the Prince of Wales, the Duke of York, and the Duke of Gloucester. Two others we know by repute—the Duke of Kent and Princess Mary. The Jubilee Fund for Maternal and Infant Welfare is a tribute to the motherhood of the Queen. Pay your tribute to her by supporting the Jubilee Fund!

The British Empire depends upon healthy mothers and healthy children. By contributing your mite to the Jubilee Fund you will contribute to the might of the British Commonwealth of Nations.

£50,000 has been contributed by the Commonwealth Government to establish a Maternal and Infant Welfare Fund for Australian women and children as a jubilee gift to the King and Queen. The general public is asked to supplement the £50,000 so that some worth-while memorial may be established. Every penny will help.

The establishment of a healthy race, fit to overcome the great problems associated with the development of Australia, begins in the maternity service. Every citizen should contribute to the Jubilee Fund.

IN THE FARM KITCHEN.

MEAT COOKERY.

WAYS OF COOKING MEAT.

(*a*) Broiling or pan-frying.

(*b*) Baking or roasting.

(*c*) Boiling.

(*d*) Pot roasting, braising, encasseroling, stewing.

In general, for (*a*) we use steaks, chops, and minced meat; for (*b*) ribs, round, rump; for (*c*) corned beef, shank end, neck, thin flank, brisket, and thin ribs; for (*d*) shoulder, thin ribs, flank, and brisket.

Meat is one of the protein foods, which means that it needs cooking at a low temperature after the outside surface has been sealed to keep in the juices and flavour. If meat is cooked at a high temperature for the necessary time, we find it has become tough and difficult to digest. This will explain why sometimes babies are given *raw* beef juices—the cooked meat could not be digested at all by them, although it is quite safe to give them the juices.

For tender cuts of meat, it is unnecessary to have long, slow cooking, which accounts for the fact that we usually cook these cuts by frying, broiling, or baking.

Long, slow cooking, after the outer surface has been sealed, will make tough cuts tender enough to be palatable, and these tough cuts are generally much cheaper than the better-known and much-sought-after expensive cuts.

The exceptions to this rule for cooking meats are the cured and "soup meats," which are started in cold water, as the object in the case of soup meat is to draw out as much flavour and nutriment as possible, instead of sealing them up inside; and the flavour of the cured meats is too strong unless they are started in cold water.

It is well known that meat is an expensive item in the household budget, and housewives could get the same amount of nourishment at a lesser cost if they knew more about the uses of the different cuts of beef, lamb, and pork. The expensive cuts average about one quarter of total dressed weight, and this, coupled with their popularity, means higher prices.

Another point is that housewives fail to take advantage of the seasonable meats or cuts which may be plentiful.

The "fancy" meats—liver, heart, &c.—are usually very inexpensive, and they give high food value for the outlay, as they are rich in mineral matter, especially iron, which is so necessary for enriching the blood.

TIME-TABLE FOR COOKING MEAT.

Lamb.—This should be cooked, so that when cut, the meat is slightly tinged with pink.

Leg, roasted: 15 minutes per lb.

Chops, broiled: 8-10 minutes per lb.

Shoulder chops: 10-12 minutes per lb.

Shoulder, roasted: 15 minutes per lb.

Pork.

Chops: 10-12 minutes per lb.
Loin roast: 20-25 minutes per lb.
Shoulder roast: 30-35 minutes per lb.
Ham, baked: 20-25 minutes per lb.
Ham, boiled: 20-30 minutes per lb.

Beef.

Broiled steaks: 8-10 minutes per lb.

Rib roasts: 10-15 minutes per lb.

Round or rump roast: 12-15 minutes per lb.

Rolled shoulder roast: 15-20 minutes per lb.

Shoulder or short rib (braised): 30-40 minutes per lb.

Shoulder, brisket, or short ribs, pot roasted: 30-35 minutes per lb.

Corned beef, boiled: 25-30 minutes per lb.

FOOD VALUE OF MEAT.

It has already been mentioned that meat is a protein food, which means that it helps to build up body tissue, and certain parts, such as liver, heart, &c., contain certain valuable vitamins and mineral salts.

An excess of meat in the diet, however, leads to various troubles, such as rheumatism and high blood pressure. Once a day is sufficient to serve meat, as there are so many other foods in the same class which can be used to give the body the necessary nourishment. These are cheese, eggs, milk, and beans and peas. Meat, on the whole, is more difficult to digest than many other foods, and therefore should not be given to children under two years old, except occasionally in the form of gravy and juices.

The following are the different beef cuts and uses for each:—

Shin: Soup meat and brawn. This is a very cheap piece.

Silverside: Salt beef and biltong. An economical cut.

Topside: Steak, roast, braised, pot roast, biltong.

Aitch bone: Roast, salt beef.

Rump: Fried, grilled.

Fillet: Fried, grilled.

Sirloin, cuts 1, 2, 3, 4: Roast, first cut is the best, as there is most fillet.

Wing rib: Braised. Roast. An economical cut.

Fore Ribs; sirloin steaks: Rolled and braised.

Middle ribs: Stew or braise. Mince meat. A cheap cut.

Back ribs: Same as foregoing.

Neck: Soup meat. Mince.

Foreshin: Soup meat and brawn. (Cheap.)

Brisket: Braising and pot roast. (Cheap.) Salted and rolled. (Cheap.) Pressed. (Cheap.) Spiced. (Cheap.)

Short ribs: Braising and soup meat. (Cheap.) Rolled and stuffed. (Cheap.)

Thin flank: Rolled and stewed with other meat, as it is a fatty piece. (Cheap.)

Thick flank: Stewing steak. (Cheapest cut.) **Pot roast.**

Leg: **Roast.**

Kidney; liver; hearts, &c.: Fried, braised, broiled.

Skirt steak: Stew (preferably with oxtail).

Chuck rib steaks: Stew and mince. (Tender cut.)

Hump: Salted. (Cheap.)

Pork.

Head: Roasted or fried.
Chump end: Roast.
Middle loin: Roast or chops.
Best end: Roast or chops.
Blade bone: Boiled.
Spare rib: Salted, roasted, or fried.
Chops: Salted.
Belly; hand: Salted.
Trotter; hock: Brawn.
Leg: Roast or salted.

Mutton or Lamb.

Shank end or knuckle: Soup meat.
Leg: Roast.
Fillet end: Roast.
Loin: Roast.
Saddle: Roast.
Neck: Roast and stew.
Best end; middle; scrag end; shoulder; Boned, rolled, and stuffed, then pot-roasted or braised.
Breast: Braised. Curry.
French cutlets: Crumbled and fried.

GENERAL RULES.

(1) Weigh meat to tell length of time required for cooking, and to see that correct weight is secured.

(2) Remove meat from paper, and keep in a cool place.

(3) Wipe meat with a damp cloth, kept for the purpose. Never wash meat under the tap.

(4) When roasting or pan broiling, always sear the surface of the meat to keep in the juices.

(5) For soups, put meat in cold water, to extract juices.

(6) When boiling meat, put it into boiling water to prevent juices from escaping.

(7) When boiling hams, put on in cold water and boil slowly to extract the salt. Boil about 20 minutes to the pound.

All recipes are on the basis of six servings. c. = cup, T. = tablespoon, t. = teaspoon.

ROAST LEG OF MUTTON AND BROWN GRAVY.

1 leg of mutton (4½ lb.).	1 onion.
1 t. salt.	1-2 bay leaves.
¼ t. pepper.	Dripping.
½ t. sugar.	About 1 c. water.
1 T. vinegar.	

(1) Clean thoroughly and trim as desired.

(2) Rub the vinegar, and then the dry ingredients into the meat.

(3) Put the meat in the pan. Pour in the water, add the leaves and onion. If the mutton is lean, put the dripping on the lean parts.

(4) Place in a hot oven, allowing the meat to brown quickly on all sides. (This is called searing.) It will take about ½ hour to brown nicely.

(5) Decrease the heat and allow the meat to cook slowly until done.

N.B.—Time required; 20-25 minutes per lb. plus 20 minutes extra.

If the pan becomes dry, a little more water may be added from time to time.

If the meat is cooked before it is actually time to serve it, cover it with a pan to prevent it from drying out.

BROWN GRAVY.

(1) Pour fat from meat pan, allowing 2 T. fat for each cup of gravy.
(2) Put fat for gravy back into pan and add an equal quantity of flour.
(3) Stir fat and flour over hot fire until well browned.
(4) Add water or stock gradually; 1 c. for 2 T. fat and 2 T. flour.
(5) Season to taste with salt and pepper.

BEEF OLIVES.

1 lb. good steak.	1 oz. suet.
2 oz. breadcrumbs.	$\frac{1}{2}$ t. salt.
1 egg.	$\frac{1}{4}$ t. pepper.
1 t. chopped parsley.	A little grated lemon peel.
A grate of nutmeg.	Stock or gravy.

(1) Cut steak thin and divide into 6 pieces.
(2) Dip a rolling pin into cold water, and beat each piece out flat.
(3) Trim nicely.
(4) Cut trimmings up very finely, and add to the breadcrumbs and other ingredients and make into a forcemeat with the egg.
(5) Divide into 6 portions.
(6) Place each portion on a piece of steak, and form into a neat roll. Tie up each end with cotton or a skewer.
(7) Put a little dripping into a pan, and when very hot fry the olives quickly until slightly brown.
(8) Put olives into a cassarole, and pour on just sufficient stock or gravy to cover them.
(9) Simmer gently for $1\frac{1}{4}$ hours.

A few minced olives or a bit of pickled walnut is an improvement to the forcemeat.

N.B.—If the steak is tough, they may simmer longer.

LAMB TERRAPIN.

2 T. butter.	1 t. dry mustard.
2 T. flour.	1 c. stock.
1 T. Worcester sauce.	$\frac{1}{2}$ c. cream or milk.
2 c. diced cold lamb.	2 hard cooked eggs.
Toast.	Parsley.

(1) Melt butter and rub in flour and mustard.
(2) Add cream or milk and stock and Worcester sauce.
(3) Cook well.
(4) Add lamb and hard cooked eggs cut in pieces.
(5) Heat thoroughly before serving.
(6) Garnish with triangles of toast and parsley.

SPANISH STEAK.

A piece of round steak, 4 inches thick.	Salt.
Stock, tomato juice, or gravy.	Chopped onion.
Flour.	Fat.
Pepper.	

(1) Pound steak and pound flour thickly into it.
(2) Rub in pepper, salt, and chopped onion.
(3) Melt fat in pan and brown surfaces of meat well in it.
(4) Surround meat with stock to within 1 inch of top of meat. Tomato juice or gravy may be used.
(5) Simmer 4 hours.

ROAST BEEF AND YORKSHIRE PUDDING.

The best cuts of beef to use for roasting are: Sirloin, ribs, aitch bone, round or part of rump.

Allow 15 minutes for every pound of beef and 15 minutes over.

(1) Wipe meat with damp cloth.

(2) Sprinkle with salt and pepper and dredge well with flour.

(3) Place in roasting pan and dot a few pieces of fat or dripping on top.

(4) Put water into pan around meat, about a quarter of an inch deep.

(5) Cover pan and allow beef to steam thus until the water has boiled away.

(6) Remove cover and roast in the oven in the ordinary way.

(7) Sear surfaces in a very hot oven to prevent escape of juices.

(8) Remove to cooler part of oven until meat is done.

N.B.—Baste the meat every now and then with melted fat to prevent it from drying out.

YORKSHIRE PUDDING.

1 c. milk.	¼ t. salt.
1 c. flour.	1 t. baking powder.
2 eggs.	

(1) Sift flour, baking powder, and salt together.

(2) Add milk gradually.

(3) Add eggs beaten until very light.

(4) Pour hot beef fat into a pan, or use the pan in which the beef was roasted, after the beef has been removed.

(5) Pour mixture into pan about ½ inch deep.

(6) Place beef on a cake cooler over pan, so that juice may drip on to pudding while it is baking.

(7) Bake 20 minutes in a hot oven.

(8) Cut into squares for serving around roast beef.

TOMATO BREDEE.

3 lb. ribs of mutton.	2 dozen tomatoes.
3 onions.	2 T. dripping or fat.

(1) Cut mutton into small pieces.

(2) Flour each piece thoroughly, and sprinkle with salt and pepper.

(3) Fry onions in dripping to a light golden brown.

(4) Remove skins from onions.

(5) Add meat and tomatoes to onions.

(6) Stew gently for at least 3 or 4 hours.

N.B.—If tomatoes are very acid, add one or two tablespoons of sugar.

SHEEP'S HEAD AND TROTTERS.

To Prepare.

(1) Put into cold water for 1 hour.

(2) Make a mixture of boiling water and lime—4 oz. lime to 2 gallons of water.

(3) Dip head into the boiling solution and scrape clean.

(4) Wash off in clean cold water.

(5) Chop along sides of nostrils through the bone.

(6) Remove eyes and ears, chop through the centre of head.

(7) Remove brain and tongue.

(8) Put trotters into the boiling lime water.

(9) Scrape clean.

(10) Chop between the cleft in the foot to the first joint.

(11) Remove the hard shell over toe.

(12) Place all in a dish of cold water.

To Cook.

1 head.	Salt and pepper.
4 trotters.	3 T. vinegar.
4 or 5 onions.	3 cloves.

(1) Put head and trotters into a dish of salt water for 1 hour. 1 T. salt to 1 gallon of water.

(2) Boil slowly in the following mixture for about 8 hours:—
Water enough to completely cover head, &c., onions, pepper, salt, and vinegar.

(3) When done, remove bones from mixture and serve hot.

N.B.—If desired, pour into moulds, and when mixture is set, serve cold.

ROAST STUFFED CHICKEN.

Stuffing.

2 c. stale breadcrumbs.
3 T. butter.
¼ t. salt.
1 beaten egg.
¼ t. pepper.
1 t. powdered sweet herbs or spiced poultry seasoning.
1 T. chopped parsley.
2 finely chopped raw potatoes.
Enough milk to moisten.

(1) Mix ingredients thoroughly.
(2) Stuff chicken.

Chicken.

1 Fowl about 6 lb.
Pepper and salt.
½ c. water.
1 T. vinegar.
3 T. butter.
Flour.

(1) Place stuffed fowl in pan.
(2) Season with salt and pepper and dredge lightly with flour.
(3) Place butter on fowl.
(4) Put vinegar and water in pan.
(5) Cover pan.
(6) Simmer gently for 1 hour, on the top of the stove.
(7) Remove cover of pan.
(8) Brown quickly. This will take about ½ hour.
(9) Turn fowl occasionally to brown every side.

Gravy.

Make same as gravy for roast leg of mutton.

CRUMBED PORK CHOPS.

6 pork chops.
Salt and pepper.
1 egg.
1½ c. dried bread-crumbs.
¼ c. vinegar.
1 c. flour.

(1) Wipe chops.
(2) Sprinkle with vinegar, and let stand for ½ hour.
(3) Place chops into hot frying pan, and fry for 1 minute on each side.
(4) Roll in flour, dip into beaten egg and roll in bread-crumbs.
(5) Put back into hot fat in pan, and fry slowly for ½ hour.

BOILED HAM.

(1) Weigh the ham.
(2) Scrape and scrub thoroughly with a brush.
(3) Cover with cold water.
(4) Bring slowly to boining point and let boil a few moments.
(5) Skim.
(6) Let boil until tender. (About 20 minutes to each pound.)
(7) When tender, set aside to partially cool in the liquid.
(8) Remove from liquid and draw off the skin.
(9) Brush over with beaten yolk of egg diluted with milk.
(10) Sprinkle with yellow sugar and cracker crumbs, mixed together. (Toasted bread crumbs could take the place of cracker crumbs.)
(11) Stick a few cloves into the ham.
(12) Put in the oven to brown the crumbs.
(13) Cover the bone with a paper frill.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs phloxes, sweet peas, lupins, &c., plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot where they will start gently and be ready for planting out in August and September.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist springtime to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted. get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish off pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transported into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur pansy, petunia, *phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors; plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Orchard Notes for July.

THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the bettles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description for the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

PLATE 212.—PROUD OF HIS PLOT.
An example of Project Club work at Devon Park State School, near Oakey.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April. 1935.	April. 1934.
North Coast.	In.		In.	In.
Atherton	4·34	34	3·23	6·05
Cairns	11·55	53	3·41	13·38
Cardwell	8 90	63	4·37	11 16
Cooktown	8·82	59	2·45	12·86
Herberton	3 90	49	2·00	4·39
Ingham	7·74	43	3 99	4 19
Innisfail	20·30	54	9 47	39·35
Mossman Mill ..	8·77	21	4·68	4·42
Townsville	3·44	64	0.47	1.69
Central Coast.				
Ayr	2·52	48	1·05	1·03
Bowen	2 75	64	1·73	0 81
Charters Towers ..	1 53	53	..	1·09
Mackay	6 31	64	3 17	3 02
Proserpine	5 86	32	7·76	4·39
St. Lawrence ..	2·83	64	0·43	2·05
South Coast.				
Biggenden	2·26	36	1 31	4 55
Bundaberg	3 29	52	7·04	11·91
Brisbane	3·86	84	3.62	6·33
Caboolture	4 66	48	4·23	16 19
Childers	2·93	40	2 77	6·13
Crohamhurst ..	6 74	41	4·82	15 90
Esk	3·12	48	2·22	3·91
Gayndah	1·49	64	0·74	2 05
Gympie	3·52	65	4 30	9 07
Kilkivan	2·33	56	2·03	4·94
Maryborough ..	3·88	64	6 35	10 12
Nambour	6·41	39	6 12	10 62
Nanango	2·02	53	1·61	3·67
Rockhampton ..	2·61	64	0 75	3 00
Woodford	4·80	48	3·99	9 32

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April. 1935.	April. 1934.
Central Highlands.	In.		In.	In.
Clermont	1 64	64		0 68
Gindie	1 25	35		0 14
Springsure ..	1 59	66	..	1 75
Darling Downs.				
Dalby	1·43	65	1·16	3 33
Emu Vale ..	1·45	39	0·76	3 60
Hermitage ..	1 46	28	0·68	2·72
Jimbour	1·42	47	1 32	3·58
Miles	1·51	50	0·22	2 42
Stanthorpe	1·80	62	1·06	4·69
Toowoomba ..	2·66	63	3·86	6,28
Warwick	1 68	70	1·77	2 36
Maranoa.				
Roma	1·35	61	0·01	0 78
State Farms, &c.				
Bungeworgorai ..	1 28	20	0·09	0 72
Gatton College ..	1·89	35	1 64	4 55
Kairi	4·11	20	..	8 36
Mackay Sugar Experiment Station	4 95	37	2 80	2 57

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·83	85	69	87	10, 19	63	20	245	9
Herberton	..	78	58	84	9, 10	47	19	200	10
Rockhampton	29·97	86	63	94	9	54	15	75	7
Brisbane	30·03	79	59	89	9	49	17	362	14
Darling Downs.									
Dalby	30·01	79	50	89	9	34	17	116	3
Stanthorpe	..	71	43	80	9	23	17	106	7
Toowoomba	..	73	51	83	9	32	17	346	7
Mid-Interior.									
Georgetown	29·87	91	64	97	6	45	19	11	1
Longreach	29·96	87	58	98	8	44	18	23	2
Mitchell	30·01	80	49	88	8	34	17	7	2
Western.									
Burketown	29·89	91	67	100	9	57	18, 20, 21	..	..
Boulia	29·96	87	60	100	1	47	23	..	..
Thargomindah	30·00	79	57	95	4	48	17	146	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June. 1935.		July. 1935.		MOONRISE. June. 1935.	MOONRISE. July. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·37	5·1	6·46	5·4	6·16	6·52
2	6·37	5·1	6·46	5·4	7·15	7·38
3	6·38	5·1	6·46	5·5	8·10	8·17
4	6·38	5·1	6·46	5·5	8·59	8·50
5	6·39	5·1	6·46	5·6	9·40	9·22
6	6·39	5·1	6·46	5·6	10·16	9·50
7	6·39	5·1	6·46	5·7	10·49	10·20
8	6·40	5·2	6·45	5·7	11·16	10·48
9	6·40	5·2	6·45	5·8	11·48	11·18
					p.m.	
10	6·40	5·2	6·45	5·8	12·17	11·53
						p.m.
11	6·41	5·2	6·45	5·9	12·47	12·28
12	6·41	5·2	6·45	5·9	1·19	1·13
13	6·41	5·2	6·45	5·10	1·54	2·6
14	6·42	5·2	6·45	5·10	2·34	3·4
15	6·42	5·1	6·44	5·11	3·23	4·6
16	6·42	5·1	6·44	5·11	4·18	5·15
17	6·43	5·1	6·44	5·12	5·20	6·26
18	6·43	5·1	6·44	5·12	6·26	7·34
19	6·43	5·1	6·44	5·13	7·35	8·41
20	6·44	5·1	6·43	5·13	8·44	9·45
21	6·44	5·1	6·43	5·14	9·48	10·48
22	6·44	5·2	6·43	5·14	10·52	11·53
23	6·44	5·2	6·42	5·15	11·55	a.m.
24	6·44	5·2	6·42	5·15	a.m.	12·57
25	6·45	5·2	6·41	5·16	12·56	2·1
26	6·45	5·3	6·41	5·16	2·0	3·0
27	6·45	5·3	6·40	5·17	3·4	3·57
28	6·45	5·3	6·40	5·17	4·6	4.48
29	6·45	5·4	6·39	5·18	5·5	5·36
30	6·45	5·4	6·39	5·18	6·1	6·16
31			6·38	5·19		6·52

Phases of the Moon, Occultations, &c.

1 June	● New Moon	5 52 a.m.
9 ,,	☾ First Quarter	3 49 p.m.
17 ,,	○ Full Moon	6 20 a.m.
24 ,,	☽ Last Quarter	12 12 p.m.

Apogee, 8th June, at 7.12 p.m.
Perigee, 21st June, at 6.6 a.m.

Venus will attain its greatest distance, 45 degrees east of the Sun on June 30, and remain above the western horizon 3 hours 28 minutes after it.

When the Sun rises on 1st July, there will be no indication that an hour or two earlier it was undergoing a partial eclipse, a third of its surface being obscured by the Moon in the neighbourhood of Spitzbergen, but only one-fourth at Edinburgh, and somewhat less at Dublin.

Mercury sets at 6.31 p.m., 1 hour 30 minutes after the Sun, on the 1st; on the 15th it sets at 5.48 p.m., 47 minutes after the Sun; Venus sets at 8.4 p.m., 3 hours 3 minutes after the Sun on the 1st; on the 15th it sets at 8.20 p.m., 3 hours 19 minutes after it; Mars rises at 1.48 p.m., and sets at 1.41 a.m., on the 1st; on the 15th it rises at 12.51 p.m., and sets at 1.12 a.m.

Jupiter rises at 3.36 p.m., and sets at 4.48 a.m. on the 1st; on the 15th it rises at 2.37 p.m., and sets at 3.46 a.m.

Saturn rises at 11.43 p.m., and sets at 12.27 a.m. on the 1st; on the 15th it rises at 10.51 p.m., and sets at 11.32 a.m.

The Southern Cross will be on the meridian, 30 degrees above the South-celestial Pole, at position XII. as on the clock-face at 8 p.m. on the 1st, and about 6 p.m on the 30th. It will also be on the meridian 12 hours later on each of these dates when it reaches VI. in a reversed position head downwards. It will then be out of sight in Queensland, being 2 degrees below the Southern horizon at Warwick, and 13¼ degrees at Cairns; when it reaches XI., it will be 58 degrees above it at Warwick, and 46¾ degrees at Cairns.

Orion will be setting an hour after the Sun on the 1st, and will be entirely absent from the evening sky almost the whole of this month.

The Scorpion, being directly opposite to the Sun on the 1st, will be rising as the Sun sets.

Virgo, with its wealth of telescopic objects, will be well situated early in the evening, but will reach the meridian about 9 p.m. on the 1st, and 7 p.m. on the 30th, at 8 p.m.; on the 15th Sagittarius, the archer, will be well in view on the eastern side of the sky. The sickle-shaped part of Leo will then be half-way between north and west.

9 July	☽ First Quarter	8 28 a.m.
16 ,,	○ Full Moon	3 0 p.m.
23 ,,	☽ Last Quarter	5 42 a.m.
30 ,,	● New Moon	7 32 p.m.

Apogee, 6th July, at 1.0 p.m.
Perigee, 18th July, at 12.42 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.